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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 43505 - 44139.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

AIR POLLUTION ABSTRACTS

VOLUME 6, NO. 1 JANUARY 1975

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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CONTENTS

Introduction 3
APTIC Publications 5
Recent Contract Awards 6
Subject Fields and Scope Notes 8
Abstract Bulletin 11
Subject Index SI-1
The terms that most closely describe the information presented in the documents are arranged alphabetically.
Author Index AI-1
Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

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APTIC Publications

Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:126, $0.65.

Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts, June 1973 GPO No. EP 4.9:125, $0.70.

Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts, March 1973, GPO No. EP 4.9:121, $2.35.

Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts, June 1973, GPO No. EP 4.9:119, $0.90.

Mercury and Air Pollution: A Bibliography with Abstracts, October 1972, GPO No. EP 4.9:114, $1.25.

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Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:95, $0.50.

Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:94, $0.65.

Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:93, $0.45.

Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts, May 1971, GPO No. EP 4.9:92, $1.00.

Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes), March 1971, GPO No. EP 4.9:88, $6.25.

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Municipal Incineration: A Review of Literature, June 1971, GPO No. EP 4.9:79, $1.00.

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Contract No. 68-02-1848, RFP No. Du-75-X073 .... *$114,140*
EVALUATION OF EMISSIONS FROM RESIDENTIAL AND SMALL COMMERCIAL STOKER FIRED BOILERS UNDER SMOKELESS OPERATIONS.
Battelle Memorial Institute, 505 King Avenue, Columbus, Ohio 43201

Contract No. 68-02-1375, Task Order No. 18 .... *$50,000*
CONVERSION OF ILLINOIS EMISSIONS DATA TO NEDS FORMAT.
PEDCo Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

Contract No. 68-02-1380, Task Order No. 8 .... *$35,000*
COMPLIANCE OF EVALUATION OF NEW JERSEY SOURCES.
Engineering Science, Inc., 7903 Westpark Drive, McLean, Virginia

Contract No. 68-02-1378, Task Order No. 10 .... *$50,000*
COMPLIANCE STATUS DETERMINATIONS/ENFORCEMENT ACTION ASSISTANCE TO REGION VIII FOR SOURCES IN THE STATE OF UTAH.
Pacific Environmental Services, Inc., 1930 14st Street, Santa Monica, California 90404

Contract No. 68-02-1378, Task Order No. 11 .... *$50,000*
COMPLIANCE STATUS DETERMINATIONS AND ENFORCEMENT ACTION ASSISTANCE TO EPA REGION VIII FOR SOURCES IN THE STATE OF SOUTH DAKOTA.
Pacific Environmental Services, Inc., Santa Monica, California

Contract No. 68-02-1382, Task Order No. 10 .... *$75,000*
EVALUATION OF SOURCE COMPLIANCE SCHEDULES FOR REGION I.
TRC, The Research Corporation of New England, 125 Silas Deane Highway, Wethersfield, Connecticut 06109

Contract No. 68-02-1376, Task Order No. 15 .... *$40,000*
DEVELOPMENT OF A COMPREHENSIVE HC INVENTORY AND TRANSPORTATION-RELATED DATA BASE FOR THE MASSACHUSETTS PORTION OF AIR QUALITY CONTROL REGION NO 42.
GCA, Technology Division, Burlington Road, Bedford, Massachusetts 01730

Contract No. 68-02-1860, RFP No. Du-75-A036 .... *$44,990*
DESIGNS AND SPECIFICATIONS FOR MOBILE ELECTROSTATIC PRECIPITATOR.
Southern Research Institute, 2000 Ninth Avenue, South, Birmingham, Alabama 35205

Contract No. 68-02-1310, Modification No. 2.. *$46,000*
STUDY OF INVARIANT MODELING OF ATMOSPHERIC TURBULENCE AND DIFFUSION.
Aeronautical Research Associates of Princeton, Inc., 50 Washington Road, Princeton, New Jersey 08540

Contract No. 68-02-1944, RFP No. Du-74-B539 .... *$150,679*
DETERMINE EFFECT OF INTERACTION OF OXIDANT AND SULFATE ON PRODUCTION OF LUNG LESIONS.
Stanford Research Institute, Menlo Park, California 94025

Contract No. 68-02-1859, RFP No. Du-74-A220.. *$45,000*
QUICK RESPONSE STUDIES TO REVIEW AND DEVELOP MEASUREMENT SPECIFICATIONS FOR CONTROL DEVICE EVALUATION.
The MITRE Corporation, Westgate Research Park, McLean, Virginia 22101 (NOTE: Contract contains options in the amount of $187,240)

Contract No. 68-02-1267, Modification No. 1... *$149,608*
INTERACTIONS OF VARIOUS AIR POLLUTANTS OF CAUSATION OF PULMONARY DISEASE.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

SUBJECT FIELDS AND SCOPE NOTES

1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

ABSTRACT BULLETIN

EMISSION SOURCES

1974

43505 **APTIC NO. 66845**

Amick, Robert S., Kenneth Axetell, Jr., and Dale M. Wells

FUGITIVE DUST EMISSION INVENTORY TECHNIQUES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 27p., 1974. 8 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-58.)*

The Clean Air Act of 1970 required all states to submit statewide emission inventories as an integral part of their implementation plans. As a result, emission inventory techniques for conventional area sources and point sources were well developed. Fugitive dust sources were not generally included in these inventories, although they are prevalent in the Great Plains, Far West, and Southwest, where arid conditions on flat, exposed topography, coupled with relatively high wind speeds, create several sources of particulate emissions. The major fugitive dust sources are unpaved roads, agriculture, land development, construction, quarrying, mining, tailings, aggregate storage, and cattle feedlots. A method is presented for determining fugitive dust particulate emission inventories for a specific, long-term inventory as well as for a more general, short-term survey. The complete fugitive dust emission inventory includes a definition of the area to be surveyed, identification of the significant sources, quantification by source category, and combination of the significant source categories emissions to obtain the total fugitive dust contribution. Emission factors are given for the various fugitive dust sources, and the data for the Colorado fugitive dust emission inventory are given.

43506 **APTIC NO. 67233**

Babich, Harvey and Guenther Stotzky

AIR POLLUTION AND MICROBIAL ECOLOGY. *CRC Critical Rev. Environ. Control, 4(3):353-421, Aug. 1974. 540 refs.*

The relationship between air pollution and microorganisms in the environment is considered in terms of microbes acting as sources of gaseous pollutants, serving as sinks and reaction sites of pollutants, and being themselves pollutants. Microbes release a variety of pollutants including the following: nitrogen oxides, hydrogen sulfide, ammonia, carbon monoxide, sulfur-containing gases, methane, ethylene, aldehydes, alcohols, and terpenes. The gases and volatiles once in the atmosphere are primary sources for a number of particulate aerosols including nitrates, ammonium ions, sulfates, and nitrogen dioxide anions. Microorganisms also serve as scavengers or sinks for numerous gaseous and particulate emissions. Some microorganisms are themselves pollutants as a result of their role in aerial transmission of diseases and allergens. The predominant airborne microbes are fungal spores in contrast to the bacterial and viral aerosols. Additional research is needed to clarify the effects of air pollutants on microorganisms.

43507 **APTIC NO. 66692**

Brocke, Werner

THE IMMISSION SITUATION FROM THE VIEWPOINT OF EMISSIONS. *(Immissions-Situation aus der Sicht der Emission). Text in German. Staub, Reinhaltung Luft, 34(9):329-332, Sept. 1974. 12 refs.*

As a result of the fact that dust separators are used or because of the technological conditions at the emission sources without dust separators the air is now charged mainly with particles below 30 micron. About 50% of the particles emitted in areas contaminated with dust have a size of 10 micron. From the increase of emissions and from emission measurements it can be estimated that in the Federal Republic of Germany there are 2 million tons of dust in the air, of which 1 million tons is below 10 micron. With very few exceptions domestic heaters and automobiles still lack any means to reduce the fine dust emission. Solutions other than the installation of dust collectors will have to be found or system changes will become necessary. Development or installation of dust collectors with a higher collection efficiency than presently feasible would be particularly important for sources with a high fraction of heavy metals in the dust or for sources whose waste gases contain salts or acids aside from those of the particulates.

43508 **APTIC NO. 66643**

Buxmann, J. and H. Hamann

CALCULATION OF PERFORMANCE GRAPHS OF DRY COOLING TOWERS. *(Berechnung der Kennfelder von Trockenkuehlern). Text in German. Brennstoff-Waerme-Kraft, 26(10):421-428, 1974. 8 refs.*

Waste heat is liberated by thermal power generation processes. Dry cooling is a process in which this waste heat is transferred to air as a cooling agent. A method for calculation of any optional operating point of dry cooling towers is described assuming ideal weather conditions. The method is suitable for direct and indirect dry cooling with forced or natural ventilation. The influence of various parameters on the operation is shown on several examples. The exponents for heat transfer and flow resistance have little influence on the operation at natural ventilation, however, water flow and air pressure have a measurable influence. At forced ventilation, substance values and changes of the air flow have negligible effect. Within limited load range, the temperature difference between warm water and cold air is approximately proportional to the capacity.

43509 **APTIC NO. 66733**

Carotti, Arrigio A. and Russel A. Smith

GASEOUS EMISSIONS FROM MUNICIPAL INCINERATORS. *New York Univ., New York, Environmental Protection Agency Contracts PH-86-67-62 and PH-86-68-121, Rept. Series SW-18C, 68p., 1974. 22 refs.*

GPO

Results are reported from a literature search on gaseous emissions from municipal incinerators and experimental studies involving the evaluation of seasonal variations in the general composition of refuse, the general composition of stack emissions and quench water, and the organic content of residual ash at four municipal incinerators in the New York City metropolitan area. The lowest rate of discharge values for fall and winter among the four municipal incinerators were 1.3 and

1.8 lbs of sulfur dioxide/ton of refuse, 2.3 and 3.9 lbs of sulfates as sulfuric acid/ton of refuse, 1.4 and 1.4 lbs of chloride as hydrogen chloride/ton of refuse, and 0.06 and 0.06 lbs of organic acids/ton of refuse, respectively, all being recorded at a batch type incinerator. The concentration of total hydrocarbons as methane in municipal incinerator stack effluents varied significantly over a relatively short period of days, with peak values of 350 and 410 ppm being recorded.

43510 **APTIC NO. 66657**

Cesario, Frank J.

A SIMPLE MODEL FOR ESTIMATING REGIONAL AUTOMOTIVE EMISSIONS. *Air Qual. Environ. Factors, no. 492:27-35, 1974. 11 refs.*

A simple model for estimating regional automotive emissions of carbon monoxide, hydrocarbons, and nitrogen oxides was developed. The model is designed for use when rough, rough, low-cost pollution estimates are desired. Traffic volumes are assumed to be available. Given the characteristics of the regional highway network, the model calculates the vehicles miles of travel over different road types in each specified subarea of the region and the vehicle speeds at which travel takes place. Emission functions that relate the output of pollutants to vehicle speeds are used to calculate emission estimates for the given travel pattern. An application to the Watertown, New York region is discussed. (Author abstract modified)

43511 **APTIC NO. 66809**

Cesario, Frank J.

TOWARD THE ESTIMATION OF TRANSPORTATION-RELATED POLLUTION. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 3, p. 115-140, June, 1974. 18 refs.*

A mathematical model for the estimation of transportation-related pollution, particularly motor vehicle pollution, is described. The model presumes that travel forecasts by mode are available exogenously and that some dispersion model capable of translating emission quantities into air quality is available. Using as input actual or projected traffic volumes over each highway link in a regional highway network for a time period specified by the user, the model provides as output estimates of pollutant emissions for each subarea of a region. It is assumed that the user has at his disposal a detailed specification of the highway network to be studied in the form of a map of the highway links and intersections in a particular region and that the user has subdivided the region into a set of mutually exclusive and contiguous subareas for which emissions estimates are to be provided. The model is applied to the Watertown, New York region; and emission factors for carbon monoxide, hydrocarbons, and nitrogen oxides are tabulated for various driving categories and subareas.

43512 **APTIC NO. 66977**

Deysing, Guenter

THE DEVELOPMENT OF POLITICAL ECONOMY IN THE DISTRICT COTTBUS AND THE TASKS RESULTING FROM IT FOR THE SOCIALIST SOCIETY IN THE COUNTRY. *(Die Entwicklung der Volkswirtschaft im Bezirk Cottbus und die sich daraus ergebenden Aufgaben fuer die sozialistische Landeskultur). Text in German. In: Technick und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 11-18.*

The district Cottbus supplied in 1970 35% of East Germany s electric power which by 1975 will have risen to 44%, 51% of the demand for soft coal which will rise to 58% by 1975, and 53% of the city gas which will rise to 65%. The further industrialization and the increasing population density in the cities, primarily in the Eastern part of the district of Cottbus, lead to enormous air pollution problems. Power generation and coal refining cause emission of dust, sulfur dioxide, oxides of nitrogen, phenols, hydrogen sulfide, ammonia, organic sulfur compounds, and other odorous substances. The sizable glass and ceramic industry emits dust, sulfur dioxide, oxides of nitrogen, fluorine compounds, lead, and sulfur trioxide. Other industrial branches operating in the district Cottbus and emitting a broad spectrum of pollutants are the chemical, textile and food industries, and metal working plants. The availability of waste gas cleaning facilities is presently at 75% and great efforts have been made to raise it to 95%. Industry operates 170 measuring stations in the areas Luebbenau, Vetschau, Boxberg, Knappenrode, and Laubusch and the Institute for Hygiene operates 90 measuring stations. The results from these measurements aid the selection of air cleaning systems.

43513 **APTIC NO. 66600**

Eberan-Eberhorst, Robert and Dusan Gruden

THE ODOR OF SPARK-IGNITION ENGINE EXHAUST. *(Der Abgasgeruch des Ottomotors). Text in German. Motortech. Z. (Stuttgart), 35(8):246-250, Aug. 1974. 12 refs.*

The effect of various parameters on the odor intensity of spark ignition engine-generated exhaust gases was studied by the dilution method. The exhaust odor was due mainly to partially oxidized hydrocarbon and nitric oxide formed during the combustion process, and to substances present in the gasoline. The odor intensity was lowest at air-excess coefficients below 1, and highest at air-excess coefficients of 1.1-1.3. The odor intensity increased with the increase of the compression ratio, especially for air-excess coefficients over 1. Also, the odor intensity was highest when the preignition was optimized for engine power. The odor was due mainly to partly oxidized hydrocarbons which make up a negligible portion of the exhaust gas. The odor intensity decreased with the increase in the proportion of paraffins, and with the reduction of the proportion of aromatics in the gasoline, while the carbon: hydrogen: oxygen ratio of the gasoline was of secondary importance. Considerable reduction of the odor intensity was achieved by the use of gaseous fuels.

43514 **APTIC NO. 67358**

Grobman, Jack and Robert D. Ingebo

JET ENGINE EXHAUST EMISSIONS OF HIGH-ALTITUDE COMMERCIAL AIRCRAFT PROJECTED TO 1990. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA- TM-X-3007, Work Unit 501-24, Rept. E-7822, 90p., March 1974. 86 refs.*

NTIS: N-74-20591

Projected minimum levels of engine exhaust emissions that may be practicably achievable for future commercial aircraft operating at high-altitude cruise conditions are presented. The forecasts are based on: current knowledge of emission characteristics of combustors and augmentors; the status of combustion research in emission reduction technology; and predictable trends in combustion systems and operating conditions as required for projected engine designs that are candidates for advanced subsonic or supersonic commercial aircraft fueled by either JP fuel, liquefied natural gas, or hydrogen. Results are presented for cruise conditions in terms of both an emission index and an emission rate. (Author abstract)

43515 **APTIC NO. 67238**

Harmsen, Hans

HARMLESS DESTRUCTION OF DANGEROUS CHEMICAL REFUSE OUT IN THE SEA. *(Schadlose Vernichtung von gefaehrliche chemischen Sondermuell auf See). Text in German. Umwelthygiene, 25(9):201-204, 1974.*

Thin acids from the production of titanium oxide and liquid chlorinated hydrocarbons have in the past been disposed of illegally in smaller amounts in barrels or other containers at uncontrolled dump sites. In some cases these waste products went in barrels to disposal sites specially assigned for this purpose. Another method was the incineration, however, without subsequent gas cleaning. Frequently the barrels were dumped into the North Sea, or the barrels were burned on the beach with winds blowing from the land to the Sea. The simplest and least polluting disposal method proved to be the incineration way out in the sea. The Dutch government assigned a point 20 nautical mi off the coast of Scheveningen for three freighters equipped with incineration facilities. The hydrogen chloride developing at incineration rises with the flue gases into the atmosphere and forms droplets of hydrochloric acid which fall into the sea water where they are immediately neutralized. Incineration takes place at temperatures between 1400 and 1600 C. All organic matter is burned entirely. The leaving waste gases consist only of the oxides of carbon and nitrogen, water vapor and halogenated hydrocarbons. The percentage of unburned chlorinated hydrocarbons is less than 0.01%. The incineration capacity of all three freighters amounts to roughly 1000/24 hr.

43516 **APTIC NO. 67017**

Haws, Richard

COMPUTER ASSISTED AREA SOURCE EMISSIONS GRIDDING PROCEDURE (CAASE) USER S MANUAL (FINAL REPORT). *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1014, EPA-450/3-74-035, 194p., Jan. 1974.*

A user manual for the Computer Assisted Area Source Emissions gridding program is presented. The CAASE programs (CAASE1) through CAASE5) with associated subroutines and off-line procedures provide an objective method for allocating county-level data to grid squares selected on the basis of demographic features and sized to give appropriate detail for input to air quality modeling programs.

43517 **APTIC NO. 66832**

Heywood, John B. and Michael K. Martin

AGGREGATE EMISSIONS FROM THE AUTOMOBILE POPULATION. *Preprint, Society of Automotive Engineers, New York, 18p., 1974. 19 refs. (Presented at the Society of Automotive Engineers/Motor and Equipment Manufacturers Association Combined Commercial Vehicle and Fuels and Lubricants Meetings, Chicago, Ill., June 17-21, 1974, Paper 740536.)*

A baseline calculation is used to illustrate the impact of the dynamics of the vehicle population on the rate of decrease of aggregate vehicle emissions and as a reference for comparison with control strategy factors such as inspection/maintenance and retrofit programs, catalyst deterioration, and schedules for post-1975 new car emission standards. The model used for the calculation divides traffic bimodally into an urban component and a rural component; for nationwide average calculations, a linear projection is used to calculate the mileage-weighted relative proportions of the two modes of travel in the future. Emissions data required in the model are evaporative and crankcase hydrocarbon emissions, exhaust hydrocarbon, carbon monoxide, and nitrogen oxide emissions, and deterioration in emissions control with increasing vehicle age, all as functions of model year. The model calculation shows that the rate at which old, higher-polluting vehicles are retired from the in-use vehicle population is the major factor in determining the rate at which aggregate emissions will decrease in the 1970s, with the precise level of post-1975 standards only becoming important in the 1980s.

43518 **APTIC NO. 66979**

Hildebrandt, Eberhard

ELECTRIC POWER GENERATION AND THE PLANNED SHAPING OF A SOCIALIST LAND CULTURE IN THE DISTRICT COTTBUS. *(Elektroenergieerzeugung und die planmaessige Gestaltung einer sozialistischen Landeskultur im Bezirk Cottbus). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 21-23.*

According to the decisions of the Eighth Party Congress in the German Democratic Republic a 6000 MW power plant capacity must be added by 1975, 60% of which will be soft coal power plants of 210 and 500 MW. The largest power plant will be the Boxberg plant in the Cottbus district with 3520 MW. A power plant of this size emits annually 20,000 tons of particulates, 200,000 tons of sulfur dioxide, 2 million tons of ash and 40 million tons of carbon dioxide. The district hygiene inspector of Cottbus has ruled that new power plants be equipped with dust separating facilities which reduce the dust content in the waste gas to 0.15 g/cu m at 95% availability of the equipment. For reduction of the influence of the SO2 emissions the new power plants will be equipped with 300 m high stacks. The possibility of applying the Polish method of ammonia intervention is being checked.

43519 **APTIC NO. 66658**

Horowitz, Joel L. and Lloyd M. Pernela

ANALYSIS OF URBAN AREA AUTOMOBILE EMISSIONS ACCORDING TO TRIP TYPE. *Air Qual. Environ. Factors, no. 492:1-8, 1974. 8 refs.*

Automobile emissions were estimated in Allegheny County (Pittsburgh), Pa., according to trip purpose, length, origin, and destinations based on travel data from the Pittsburgh transportation survey and emissions data developed by the Environmental Protection Agency. Estimates of diurnal evaporative emissions, cold-start, and hot soak emissions, and actual running emissions are included. Home-based work trips and trips to an from the central area of the county each produce one third to one half of Allegheny County automobile emissions and are the dominant causes of automobile emissions in the county. Cold starts and evaporations produce half of the hydrocarbons and a quarter of the carbon monoxide. Trips shorter than 5 mi and trips longer than 5 mi produce roughly equal quantities of CO and hydrocarbons. Long trips produce greater quantities of nitrogen oxides. Improved peak period and radial transit may be effective in improving air quality through reducing automobile travel if such transit reaches peripheral areas of the county. Cold start and evaporative emissions may significantly impair the effectiveness of transit approaches that rely on automobile for residential collection and distribution. (Author abstract modified)

43520 **APTIC NO. 66974**

Iki, Tsuneyo

PRODUCTION AND TECHNOLOGY OF IRON AND STEEL IN JAPAN DURING 1973. *Trans. Iron Steel Inst. Jap., 14(3):217-235, 1974.*

The iron and steel industry in Japan during 1973 is reviewed. Production increased and reached 109,3000,000 tons, a 12.8% increase over 1972. The technology, facilities, and production in pigmaking, steelmaking, continuous casting, rolling, steel processing and surface treatment, ironmaking by nuclear energy, and use of computers are discussed. Technologies introduced from foreign countries are listed and described. Environmental pollution caused by the iron and steel industry is also reviewed. It includes air pollution by sulfur oxides, nitrogen oxides, and fine dusts, water pollution, noise, and industrial wastes. New stack gas desulfurization equipment, research on pollution control, and dust control methods will improve air quality. Ore slags, used cans, and industrial water waste materials are being used in new ways. Various research committees of research societies are conducting meetings on problems such as pollution, improving technology, and design problems.

43521 **APTIC NO. 66698**

Kahlert, W.

EXPERIENCE WITH THE CONSTRUCTION AND INITIAL OPERATION OF SIX COMBINED GAS/STEAM POWER PLANT BLOCKS OF IDENTICAL DESIGN. *(Erfahrungen beim Bau und bei der Inbetriebnahme von sechs zeichnungsgleichen Kombi-Bloecken). Text in German. VGB Kraftwerkstechnik, 54(8):537-547, Aug. 1974. 3 refs.*

The construction of power plant blocks according to an identical design has the advantage of requiring less planning costs, speeding up the licensing process and simplyfying the initial operation. The combined gas/steam blocks have natural gas-fired steam generators with a capacity of 1032/1140 tons/hr at 207 bar and 535 C steam temperature. Gas turbines with a capacity of 56 MW at gas entrance temperatures of 800 C were installed. Since natural gas containing no sulfur is used as primary energy it was decided to install only 60-meter high stacks, which the licensing authorities did not accept. They requested the installation of 120-meter high stacks. The following emission limits were imposed, carbon monoxide 250 mg/cu m, carbon (in organic substances) 50 mg/cu m, aldehydes calculated as H-CHO 20 mg/cu m, oxides of nitrogen calculated as nitrogen dioxide 600 mg/cu m, and NO2 300 mg/cu m. These values have not been exceeded at any time. Emission measurements to a distance of 2000 m on the leeward and windward side have shown that the emissions are far lower than the maximum allowable values.

43522 **APTIC NO. 66667**

Knoernschild, Eugen

THERMIONICS, A SPIN-OFF OF SPACE TECHNOLOGY. NON-CONVENTIONAL ENERGY SUPPLY FOR MOTOR VEHICLES. *(Thermionik als Abfallprodukt der Weltraumtechnik. Eine unkonventionelle Energieversorgung von Kraftfahrzeugen). Text in German. VDI (Ver. Deut. Ingr.) Z. (Duesseldorf), 116(11):859-863, Aug. 1974.*

The general principle of the latest achievements in thermionics are described, and possibilities of the application of thermionics for electricity generation in motor vehicles and other terrestrial purposes are predicted. With combustible fuels or nuclear reactors as heat source, thermionic electricity generators can be used for powering vehicles, and as minature or full-size power plants. The further development of flame-heated thermionic electricity generators may result in a prototype vehicle powered by this technique in about 10 yrs. Such vehicles are expected to be environmentally advantageous due to reduced exhaust emission and low noise level. The efficiency of thermionic reactors is expected to reach 30%.

43523 **APTIC NO. 66604**

Kossen, N. W. F.

ENERGY FOR A BETTER ENVIRONMENT. *(Energie voor milieuverbetering). Text in Dutch. Ingenieur, 86(34):646-648, Aug. 1974.*

The additional energy consumption due to environmental protection measures to be implemented by 1985 is estimated. In the air pollution prevention area, oil desulfurization requires about 10 times as much energy as does flue gas desulfurization. The additional gasoline consumption by vehicles due to emission control measures amounts to 8 to 18% of the total gasoline consumption. In addition, increased energy losses at the refinery level are expected from changes in the gasoline composition as required for unleaded gasoline. The overall energy expenditure expected for environmental protection measures in the area of air, water and soil pollution control, noise abatement, and thermal pollution abatement is estimated at 2.7-8.5% of the total amount of energy generated in 1985.

43524 **APTIC NO. 66830**

Landen, E. W. and J. M. Perez

SOME DIESEL EXHAUST REACTIVITY INFORMATION DERIVED BY GAS CHROMATOGRAPHY. *Preprint, Society of Automotive Engineers, New York, 15p., 1974. 12 refs. (Presented at the Society of Automotive Engineers Motor and Equipment Manufacturers Association Combined Commercial Vehicle and Fuels and Lubricants Meetings, Chicago, Ill., June 17-21, 1974, Paper 740530.)*

Chromatographic analyses are performed on diesel test engine exhausts to obtain reactivity information pertinent to photochemical smog formation. A number of low molecular weight hydrocarbons having less than six carbons are analyzed; using the reactivity index as a criterion, much of the diesel exhaust reactivity can be attributed to ethylene and propylene caused by the thermal decomposition of the fuel. Hydrocarbons having four to seven carbons, including relatively reactive olefins, are generally low in volume concentration and therefore contribute little to the overall exhaust reactivity. Hydrocarbons, in terms of parts per million carbon above C7 are low in present diesel engine designs, so that individual volume concentrations are generally fractional ppm. Reactivity per horsepower-hour from diesel engine exhaust is less than that from the one small industrial gasoline engine tested by the heavy-duty truck diesel engine cycle; it is questionable if diesel engine hydrocarbons from well designed engines need be controlled below present levels to reduce smog in metropolitan areas, especially since diesel engines burn less than 10% of the total vehicle fuel used. (Author abstract modified)

43525 **APTIC NO. 66654**

Miller, V. H. and H. A. Cheetham

RESULTS OF NOX MEASUREMENTS IN A TANGENTIAL FIRED 275 MW AND A FRONT WALL FIRED 350 MW BOILER. *Riv. Combust., 28(5):160-162, May 1974.*

Nitrogen oxides, nitrogen dioxide, sulfite, and solids were measured in the exhaust gas from two large boiler plants. The type and size of oil burners used to fire the boilers were almost identical, but the boilers were different. One was corner fired and other was front wall fired. The NOx formation was independent of boiler type but very dependent on heat release. The formation of SO3 was independent of boiler load. Reducing the heat input rate per unit area of heating surface by 50% caused a drop in NOx from 400 ppm to 255 ppm. It is impractical to double boiler combustion chamber sizes. Recirculation through or near the burners offers a better solution, but the amount of recirculation needs to be determined. (Author abstract modified)

43526 **APTIC NO. 66677**

Ose, Hironobu, Takahiko Sato, and Satoo Kato

STUDIES ON THE EVALUATION AND COUNTERMEASURES FOR BAD ODORS (REPORT NO. 1) PHYSICO-CHEMICAL MEASUREMENT AND SENSITIVITY TESTS OF ENVIRONMENTAL BAD ODOR. *(Akushu no hyoka to taisaku ni kansuru kenkyu (Dai-ippo) Akushu kankyo no rikagakuteki sokutei to kanno shiken). Text in Japanese. Akushu no kenkyu (Odor Research J. Japan), 4(16):27-30, Aug. 1974. 10 refs.*

Odor concentrations at several animal waste treatment plants, animal breeders and chemical treatment plants were measured by physico-chemical methods and by sensitivity tests. Ammonia was measured by the detector tube method and Nessler method. Hydrogen sulfide was measured by methylene blue method, and acrolein by the colorimetric method using 4-hexylresorcinol and mercuric chloride. To a sample solution of acrolein was added 0.1 ml 4-hexylresorcinol and 0.2 ml mercuric chloride. A mixed solution of 5 ml trichloroacetic acid and 5 ml 96% ethanol was added to the above mixture. The absorbance of the solution was measured near 605 nm. A linear calibration curve was obtained for acrolein concentration under 25 micrograms. The odor was greatly dependent on the NH3 concentration. The acrolein concentrations at all the plants were almost negligible.

43527 **APTIC NO. 67180**

Pierson, William R., James W. Butler, and David A. Trayser

NITRATE AND NITRIC ACID EMISSIONS FROM CATALYST-EQUIPPED AUTOMOTIVE SYSTEMS. *Environ. Letters, 7(3):267-272, 1974. 8 refs.*

Measurements were made on the diluted exhaust of a dynamometer- mounted 1973 Ford 351C internal combustion engine at simulated 60 mph speed and road load to find out if the addition of a noble-metal oxidation catalyst for emission control would result in the production of nitric acid and nitrates. The amount of nitrates and/or HNO3 measured from the engine without the catalyst device was very small, 0.0003 g/mi at most, with evidence suggesting that even part of this figure was spurious. The addition of a noble-metal monolithic oxidation catalyst to the system caused no perceptible increase in the figure, thus demonstrating that catalyst-induced nitrate and HNO3 emissions are inconsequential at the conditions described. (Author abstract modified)

43528 **APTIC NO. 67259**

Plassmann, Bresser, Weyrauther, and Kiefer

EEC REPORT. STUDY OF THE ENVIRONMENTAL POLLUTION AND ENVIRONMENTAL INJURIES BY TRAFFIC IN URBAN AREAS - NOISE AND EXHAUST GASES. II.1.1. ANALYSIS OF RELATIONSHIPS BETWEEN TRAFFIC DENSITY, TRAFFIC COMPOSITION AND EXTENT OF EXHAUST GAS POLLUTION. II.1.2. STUDY OF THE COSTS FOR MODIFICATIONS ON THE AUTOMOBILE FOR REDUCTION OF THE EXHAUST GAS EMISSION. *(EG-Enquete. Untersuchung der Umweltbelaestigung und Umweltschaedigung durch den Strassenverkehr in Stadtgebieten - Laerm und Abgase - II.1.1. Analyse der Zusammenhaenge zwischen Verkehrsaufkommen, Verkehrszusammensetzung und Umfang der Abgasbelastung. II.1.2. Untersuchung der Kosten fuer Veraenderungen am Fahrzeug zur Verringerung der Abgasemission). Text in German. Technischer Ueberwachungs-Verein Rheinland, e.v., Cologne (West Germany) and VDI (Verein Deutscher Ingenieure), Cologne (West Germany), Kommission Laermminderung and Kommission Reinhaltung der Luft, 70p., 1974. 15 refs.*

An emission inventory which has recently been worked out for Cologne was used to determine costs for controlling emissions from cars. A detailed description of the procedural steps leading to the emission inventory and of the results is given. A certain proportionality between traffic density and the extent of the emissions of hydrocarbons, nitric oxide, lead, and carbon monoxide existed. It was absent in the case of soot and sulfur dioxide. These pollutants stem mostly (SO2) and exclusively (soot) from trucks whose number varies greatly among traffic in the various parts of the city and which is determined by the presence of industry. In selected streets of the city of Cologne, emission measurements were carried out and the extent of the emissions in these streets was determined at the same time. By means of mathematical analysis, the relationship between automobile emissions and resulting ground level emissions with regard to various wind conditions was determined. For a transfer of the relationship to other large cities, the equivalents of the selected streets in the city model (the model is explained and illustrated in the outline) were sought. The measured emission concentrations were compared with the medical emission limit values described in part II.2 of the report to determine the excess frequency. Only CO was found to exceed the recommended limits. By means of questionnaires sent out to automobile manufacturers it was attempted to get information on the costs for reducing the emission from automobiles.

43529 **APTIC NO. 66986**

Pommer, Gerd

COOPERATION BETWEEN INDUSTRY AND AGRICULTURE IN THE DISTRICT MERSEBURG FOR REDUCTION OF THE EMISSIONS AND OF THE EFFECTS OF IMMISSIONS. *(Zusammenarbeit zwischen Industrie und Landwirtschaft im Kreis Merseburg zur Verminderung der Emissionen und der Immissionsauswirkungen). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 74-78.*

The following measures for reducing immission effects on agriculture have been realized or are under preparation. Industry is erecting a measurement grid for dust and sulfur dioxide to obtain information on the pollution of the area which in turn will permit the adequate selection of more smoke resistant plants for cultivation in the air polluted areas. The dust emissions are reduced by increasing the availability of electrostatic precipitators. Short-term emissions are reduced. Nitrogen-containing waste water is supplied for irrigation. Industry supplies power and provides building space for the purpose of drying green fodder. Agriculture will grow fodder in areas with less dust emission, select grains resistant to SO2, abstain from planting alfalfa and linseed in SO2 polluted areas and will attempt to increase the yield and wash off the dust by irrigation with N-containing waste water.

43530 **APTIC NO. 67357**

Riddlebaugh, Stephen M.

USE OF FLUIDIC OSCILLATOR TO MEASURE FUEL-AIR RATIOS OF COMBUSTION GASES. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA-TM-X-3068, Work Unit 501-24, Rept. E-7872, 22p., June 1974. 8 refs.*

NTIS: N74-25951

A fluidic oscillator was investigated for use in measuring fuel-air ratios in hydrocarbon combustion processes. The oscillator was operated with dry exhaust gas from an experimental combustor burning ASTM A-1 fuel. Tests were conducted with fuel-air ratios between 0.015 and 0.031. Fuel-air ratios determined by oscillator frequency were within 0.001 of the values computed from separate flow measurements of the air and fuel. The relationship of combustion products to the air-fuel ratios is mathematically described. (Author abstract modified)

43531 **APTIC NO. 66831**

Tingley, Daniel S. and John H. Johnson

EMISSIONS AND FUEL USAGE BY THE U. S. TRUCK AND BUS POPULATION AND STRATEGIES FOR ACHIEVING REDUCTIONS. *Preprint, Society of Automotive Engineers, New York, 29p., 1974. 26 refs. (Presented at the Society of Automotive Engineers/Motor and Equipment Manufacturers Association Combined Commercial Vehicle and Fuels and Lubricants Meetings, Chicago, Ill., June 17-21, 1974, Paper 740537.)*

An approach to mathematically modeling the United States truck and bus population is presented which utilizes domestic factory sales figures combined with a scrappage factor as a building block for the total population. Comparison with historical data for 1958-1970 shows that the model follows trends well for intermediate parameters such as total vehicle miles per year, total fuel consumption, and scrappage. The model details the parameters of fuel consumption and hydrocarbon, carbon monoxide, nitrogen dioxide, carbon dioxide, and particulate emissions from gasoline and diesel engines from the time span 1958-2000 in 1-year increments; it shows that for hydrocarbon and CO emissions trucks and buses could equal or exceed automobile emissions in the early 1980s, depending on the degree of control. Three population control strategies are analyzed to determine their effects on reducing fuel consumption and air pollution in later years; a combination of the strategies, i.e., substitution of diesel engines for gasoline engines in new vehicles, field retrofit of pre-1968 vehicles, and more stringent emissions restrictions, results in the greatest reductions of fuel consumption and pollutant emissions. (Author abstract modified)

43532 **APTIC NO. 66943**

Yamaki, Naoomi, Takaaki Kita, Koichi Yoshida, Takeo Takahashi, Takashi Kobayakawa, and Mamoru Sakata

ANALYSIS OF AUTOMOBILE EMISSION. *(Jidosha hiki gasu ni fukumareru busshitsu ni kansuru kenkyu (2) - shu to shite arudehido rui no sokutei). Text in Japanese. Shimazu Hyoron (Shimazu Rev.), 31(3):77-91, 1974. 3 refs.*

Automobile exhausts collected in a constant volume sampler were analyzed for carbon monoxide, hydrocarbons, nitrogen oxides, and aldehydes during running simulation tests on four automobiles using a chassis dynamometer, two different test fuels (32% and 41% in aromatic hydrocarbons), and two different driving modes (10 and LA-4). Hydrocarbon emissions were greater and NOx emissions less for the 10 driving mode than for the LA-4 driving mode; CO emissions did not vary noticeably with driving mode. Carbon monoxide and hydrocarbons were emitted more during cold start than during hot start, while NOx emissions were about the same for either start. Aldehydes, as measured by two different methods, ranged from 0.07-0.37 g/km or from 0.03-0.21 g/km during a 1 km run, with no differences being noted between cars of different models. Amounts of aldehydes emitted were however larger for cars of larger piston displacement and for the 10 mode driving cycle as compared to the LA-4 mode. Differences in aldehyde emissions were not detected for runs using different fuels. Formaldehyde was the greatest fraction of the aliphatic aldehydes emitted; aromatic aldehydes accounted for about 40% of all aldehydes. The para-rosaniline method, used for determining formaldehyde, was not suitable for determination of aldehydes in general.

43533 **APTIC NO. 66766**

Environmental Protection Service, Ottawa (Canada), Air Pollution Programs Branch

NATIONAL INVENTORY OF SOURCES AND EMISSIONS OF ASBESTOS, BERYLLIUM, LEAD, AND MERCURY. SUMMARY OF EMISSIONS FOR 1970 (FINAL REPORT). *Rept. EPS-3-AP-74-1, 25p., Jan. 1974.*

Results are presented from a national inventory of sources and emissions of asbestos, beryllium, lead, and mercury in Canada. Total amounts emitted during the year 1970 are estimated as: 16,392 tons of asbestos, 7.8 tons of Be, 21,416 tons of Pb, and 82.2 tons of Hg. Asbestos mining and processing account for 99.4% of the total asbestos emissions, while combustion of coal, coke, and heavy oil account for nearly 100% of the beryllium emissions. The chlor-alkali industry is responsible for 32.1% of the Hg emissions, followed by 24.3% resulting from petroleum combustion. Combustion of gasoline fuels accounts for the largest percentage of Pb emissions, being 66% of the total. Copper, nickel, and zinc production account for about 22% of the lead emissions.

43534 **APTIC NO. 66955**

Ministry of International Trade and Industry and Hokkaido-Tomakomai Municipal Government

A REPORT ON THE PRELIMINARY INVESTIGATION FOR THE INDUSTRIAL DEVELOPMENT OF THE TOMAKOMAI AREA (AIR POLLUTION). *(Tomakomai chiku sangyo kogai sogo jizen chosa (taiki kankei) hokokusho). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(8):59- 69, Aug. 1974.*

Tomakomai city which has been the center of paper pulp, wooden products, and lumber industries is changing into a heavy and chemical industrial area. With the development of industrial conglomerates of aluminum-electric power-oil refinery-petrochemicals, the pollution problems are increasing. The sulfur oxides concentration measured by the lead dioxide method showed a localized pollution in the vicinity of paper mills, and the yearly average SOx concentration measured by the conductimetric method was relatively low and below the environmental standard. The settling particulate concentrations measured in 1971 and 1972 did not show much increase compared to those in preceding years. The high hydrogen fluoride concentration was localized in the vicinity of an aluminum refinery. The relationships between meteorological factors and pollution were analyzed in regard to the wind direction frequency (wind rose) and distribution of wind velocity. The estimation of atmospheric pollutant concentration was based on data on future operations submitted by each industry by means of wind tunnel dispersion tests and theoretical equations of dispersion. The maximum SOx concentrations calculated based on the original industrial development plan were 0.389 ppm at E wind and 0.293 at S wind, exceeding the environmental standard. Recommendations for SOx pollution control by means of conversion to low sulfur content fuel, desulfurization processes, and increase in stack height were issued. With the cooperation of industry, it is now certain that the SOx concentration can be maintained below the environmental standard.

43535 **APTIC NO. 67295**

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Quality Planning and Standards

THE 1972 NATIONAL EMISSIONS REPORT NATIONAL EMISSIONS DATA SYSTEM (NEDS) OF THE AEROMETRIC AND EMISSIONS REPORTING SYSTEM (AEROS). *EPA-450/2-74-012, 434p., June 1974.*

NTIS: PB 235748/AS

Annual cumulative estimates are summarized for source emissions of five criteria pollutants: particulates, sulfur oxides, nitrogen oxides, hydrocarbons, and carbon monoxide. Data are presented for the nation as a whole, for individual states, and for Air Quality Control Regions and individual interstate portions thereof. The grand total of pollutants for the United States in tons/yr are particulates, 18,566,748; sulfur oxides, 32,023,487; nitrogen oxides, 24,051,210; hydrocarbons, 26,632,852; and carbon monoxide, 101,693,648. The main source categories are fuel combustion, industrial processing, solid waste disposal, and transportation. (Author abstract modified)

1973

43536 **APTIC NO. 66811**

Bressan, D. J., R. A. Carr, and P. E. Wilkniss

GEOCHEMICAL ASPECTS OF INORGANIC AEROSOLS NEAR THE OCEAN- ATMOSPHERE INTERFACE. *Advan. Chem. Ser., no. 123:17-30, 1973. 69 refs. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry Meeting 162nd, Washington, D. C., Sept. 15, 1971.)*

Geochemical aspects of inorganic aerosols near the ocean- atmosphere interface are discussed; and data are presented for the composition of marine aerosols with respect to geographic area, the relative chemical composition of marine aerosol salt versus altitude, and elemental ratios in aerosols. Apparently, sources contributing to the composition of inorganic aerosols near the ocean-atmosphere interface are the oceans themselves, continental dust, volcanic ash, atmospheric production of particulates, and, to a lesser extent, human activity and extraterrestrial inputs. Characteristic elements and elemental ratios can be used to determine some of these sources and detect ion fractionation at the sea-air interface. Rain water chemistry is not always simply related to that of the marine aerosol as indicated by rain particulate composition analyses performed. (Author abstract modified)

43537 **APTIC NO. 67292**

Dubois, L., T. Teichman, and J. L. Monkman

THE SULFURIC ACID CONTENT OF SOOT. *Sci. Total Environ., vol. 2:97-100, 1973. 7 refs.*

The sulfuric acid and total water-soluble sulfate content of soot originating from the combustion of fuel oil was determined for 89 samples collected in a pilot plant boiler, fueled by residual fuel oil containing 2-5% sulfur, and for 72 samples taken from six different locations between the firebox and chimney of domestic heating furnaces burning light fuel oil. The percentage of sulfuric acid in the total sulfate varied from as low as 4.7% to as high as 50.9%. The percentage of sulfuric acid in soot varied from 0.9-7.6%. The fact that the percentages of sulfuric acid and sulfate in soot were higher than their percentages measured in urban air particulate matter was consistent with a dilution process taking place and suggested that most of the sulfuric acid found in urban air is emitted as such and not formed by the oxidation of sulfur dioxide to sulfur trioxide with subsequent hydration to the acid. (Author abstract modified)

43538 **APTIC NO. 66835**

Escher, William J.

PROSPECTS FOR LIQUID HYDROGEN FUELED COMMERCIAL AIRCRAFT. *Escher Technology Associates, St. Johns, Mich., Rept. PR-37, 39p., Sept. 1973. 36 refs.*

A survey of the technical challenges and potential energy and environmental benefits to the United States of conversion of its commercial aviation sector to liquid hydrogen fuel is presented. Advantages of the conversion include: superior heating value (2.8 times that of jet fuel); the utilization of relatively abundant domestic resources of coal, nuclear, and solar energy; and the elimination of carbon monoxide, carbon dioxide, hydrocarbon, and particulate emissions. Hydrogen fuel provides a net reduction in tanked energy requirements of up to about 40% as compared to current hydrocarbon fuel, suggesting the possibility for a significantly improved energy conversion efficiency of commercial aviation. Technical feasibility for the liquid H2 airplane appears well established, but supporting economic studies are lacking. Hydrogen s bulkiness (3-4 times that of conventional jet fuel) and cryogenic nature (21 K) pose significant engineering challenges.

43539 **APTIC NO. 67271**

Hub, K. A., J. G. Asbury, W. A. Buehring, P. F. Gast, R. A. Schlenker, J. T. Weills, K. P. DuBois, and J. L. Gardner

A STUDY OF SOCIAL COSTS FOR ALTERNATE MEANS OF ELECTRICAL POWER GENERATION FOR 1980 AND 1990. SUMMARY REPORT (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Special Reactor Study Group and Chicago Univ., Ill., Atomic Energy Commission Contract W-31-109-Eng-38, 201p., Feb. 1973. 144 refs.*

NTIS: ANL-8092

A summary report is presented on internal and external social costs of alternative electrical energy generating systems for the years 1980 and 1990. The external costs treated include such effects as land despoilation; damage to health, property, and the environment resulting from the release of air and water pollutants; and aesthetic damage. A nominal 1000 MWe generating unit serves as the basis for defining descriptive parameters for both nuclear alternative plants and fossil fuel alternative plants. The nuclear alternatives consist of the boiling water reactor, the pressurized water reactor, the high temperature gas cooled reactor, and the liquid metal cooled fast breeder reactor; fossil fuel alternatives are coal, oil, and gas. Combined cycle systems suffer in comparison with reactors because of their high internal cost, though the combined cycle system will probably be most competitive at intermediate-load duty. Comparison between the pressurized water reactor and the liquid metal cooled fast breeder reactor shows that the latter has advantages in system efficiency, yearly fuel use, mining land use, thermal discharge, and health effects. Annual effects are presented for each fuel cycle.

43540 **APTIC NO. 67272**

Hub, K. A., J. G. Asbury, W. A. Buehring, P. F. Gast, R. A. Schlenker, J. T. Weills, K. P. DuBois, and J. L. Gardner

SOCIAL COSTS FOR ALTERNATE MEANS OF ELECTRICAL POWER GENERATION FOR 1980 AND 1990. REFERENCE REPORT. CHAPTER II. DESCRIPTION OF ENERGY SYSTEMS (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Special Reactor Study Group and Chicago Univ., Ill., Atomic Energy Commission Contract W-31-109-Eng-38, 420p., March 1973. 257 refs.*

NTIS: ANL-8093(Vol. 2)

A summary report is presented to provide information necessary for the numerical assessment of social costs for alternative means of electrical power generation for the years 1980 and 1990. Alternatives considered include: coal, oil, and gas energy-cycle systems; nuclear power systems such as the pressurized water reactor, the boiling water reactor, the high temperature gas cooled reactor, and the liquid-metal fast breeder reactor; and hydroelectric power systems. Topics covered include: characteristics of electric energy demand, reliability and technical planning, regulation and licensing, the supporting fuel cycles for nuclear power systems, the changing role of hydroelectric power, coal gasification processes, the impact of different fuel cycles on air pollutant generation and land alteration, and occupational injuries associated with each alternative.

43541 **APTIC NO. 67273**

Hub, K. A., J. G. Asbury, W. A. Buehring, P. F. Gast, R. A. Schlenker, J. T. Weills, K. P. DuBois, and J. L. Gardner

SOCIAL COSTS FOR ALTERNATE MEANS OF ELECTRICAL POWER GENERATION FOR 1980 AND 1990. REFERENCE REPORT. CHAPTER III. COST-RISK-BENEFIT CONCEPTS AND MODEL. CHAPTER IV. SOME REGULATIONS PERTINENT TO THE ENERGY SYSTEMS. CHAPTER V. IMPACTS AND COSTS (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Special Reactor Study Group and Chicago Univ., Ill., Atomic Energy Commission Contract W-31-109-Eng-38, 396p., March 1973. 313 refs.*

NTIS: ANL-8093(Vol. 3)

A reference report is presented to provide information necessary for the assessment of social costs for alternative fossil fuel and nuclear power electrical generation for the years 1980 and 1990. The report is divided into sections covering cost-risk- benefits concepts and models, regulations pertinent to the energy systems, and impacts and costs. The cost-risk-benefits analysis covers social costs and benefits, energy production and economic welfare, ideal allocation of resources, natural resource use, property resources, and human resources. Regulations pertinent to the energy systems are presented in terms of radioactivity, releases of fossil fuel pollutants to the air, respiratory dust levels in coal mines, radioactivity exposures of uranium miners, and water quality. The impacts and costs section deals with human health effects, property value losses, crop damages, deterioration in urban areas, thermal discharge effects, resource use, long-term high-level waste management, nuclear materials safeguards, abatement procedures, secondary external effects, and limitations of the study.

43542 **APTIC NO. 67274**

Hub, K. A., J. G. Asbury, W. A. Buehring, P. F. Gast, R. A. Schlenker, J. T. Weills, K. P. DuBois, and J. L. Gardner

SOCIAL COSTS FOR ALTERNATE MEANS OF ELECTRICAL POWER GENERATION FOR 1980 AND 1990. REFERENCE REPORT. CHAPTER VI. THERMAL DISCHARGE FROM POWER PLANTS. CHAPTER VII. FUEL CYCLE EFFECTS 1980, 1990 (FINAL REPORT). *Argonne National Lab., Argonne, Ill., Special Reactor*

Study Group and Chicago Univ., Ill., Atomic Energy Commission Contract W-31-109-Eng-38, 143p., March 1973. 45 refs.

NTIS: ANL-8093(Vol. 4)

Social costs for alternate means of electrical power generation for 1980 and 1990 are analyzed in terms of thermal discharge from power plants and fuel cycle effects. Various cooling means are investigated along with their impact on environmental resources, terrestrial and aquatic populations, an human activities. Dollar costs are estimated, and a summary matrix is given of impacts and dollar costs. New conversion technology to significantly increase the average thermal efficiency, and thus lower the thermal discharge, is not expected. High efficiency electrical conversion processes and large scale application are expected in the long run (past 2000), but until then, reduction in the discharge heat per MW of electrical power generated will not be large. The annual social costs for 1980 and 1990 are estimated for six types of fuel-cycle systems, viz., coal, oil, and gas energy systems and three types of nuclear reactor systems.

43543 **APTIC NO. 67230**

Jaffe, Louis S.

CARBON MONOXIDE IN THE BIOSPHERE: SOURCES, DISTRIBUTION, AND CONCENTRATIONS. *J. Geophys. Res., 78(24):5293-5305, Aug. 20, 1973. 68 refs.*

Sources, distribution, and concentrations of carbon monoxide in the biosphere are reviewed. Total annual tonnages of CO from man-made sources exceeded 132 million metric tons in the United States and 359 million metric tons globally in 1970. The largest single technological source of CO is the internal combustion engine. Atmospheric CO abundance in the biosphere of urban areas is not uniformly distributed and is dominated by the anthropogenic sources, being related to proximity to the source, human activity patterns, and meteorological factors. These concentrations range from about 1 to over 70 ppm, with brief peak levels in dense traffic as high as 140 ppm. The removal of CO from the atmosphere, as well as the sources and dispersion, controls the local concentration. Man s CO production considered on a global basis is relatively minor in comparison with natural source production which includes atmospheric oxidation of methane, the ocean, decay of plant chlorophyll, and terpene oxidation from plant sources. Their total source strength is estimated at 3-25 times the man-made sources as a whole. Background concentrations, from both natural and anthropogenic sources, normally range from 0.04-0.20 ppm, with natural occasional concentrations being as high as 0.80 ppm at ground level in remote clean air areas. The higher concentrations are found in the northern hemisphere. Estimated global CO emissions are tabulated from various industrial, non-industrial, and transportation activities of man. (Author abstract modified)

43544 **APTIC NO. 66822**

Jernelov, Arne

CYCLING OF MERCURY IN THE ENVIRONMENT. *Preprint, Swedish Water and Air Pollution Research Lab., Stockholm (Sweden), 13p., Nov. 1973. 11 refs.*

The cycling of mercury in the environment is considered, with increases in global Hg concentrations being postulated as possibly due to increased degassing from the earth s crust as a result of man s agricultural practices. World production of mercury is on the order of 1 times 10 to the 10 gm plus the release from the burning of fossil fuels, heating of Hg-containing minerals, and other industrial activities. An estimate of 5 times 10 to the 10 gm/yr is given for the amount of Hg in rainfall. Estimations of the atmospheric flux of Hg in relation to human activities give an increase which is much smaller than the observed increase occurring during the last decades (factor of two); thus the latter cannot be accounted for by the Hg released from Hg-handling industries and fossil fuel burning activities. Changes in agricultural practices involving more efficient plowing, the use of fertilizers, and other techniques are postulated to be possibly accelerating the biological processes in the soil and perhaps increasing the formation rate of volatile Hg compounds.

43545 **APTIC NO. 66814**

Lakin, Hubert W.

SELENIUM IN OUR ENVIRONMENT. *Advan. Chem. Ser., no. 123:96-111, 1973. 46 refs. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry Meeting 162nd, Washington, D. C., Sept. 15, 1971.)*

A review is presented on the natural and manmade sources of selenium in the environment. The primary sources of Se are volcanic emanations and metallic sulfides associated with igneous activity, while secondary sources are biological sinks in which the metal accumulates. The Se content of black shales, coal, and petroleum is 10-20 times the crustal abundance (0.05 ppm). Seleniferous black shales are the parent materials of the widespread seleniferous soils of the western plains of the United States. The average Se content of coal in the United States is about 3 ppm, while petroleum contains about 0.2 ppm on the average; when burned, Se-containing coal and petroleum give rise to a redistribution of particulate Se and selenium oxide. The burning of fossil fuels in the United States is estimated to yield 8,000,000 lbs of Se annually as an air pollutant. The Se content of streams is a function of the presence of Se in the drainage system and of the pH of the stream water, with major rivers averaging about 0.2 micrograms/l of Se. The Se content of sewater averages 0.09 micrograms/l. Selenium in the atmosphere as measured by the Se content of snow is a function of the industrial activity in the vicinity of measurement. (Author abstract modified)

43546 **APTIC NO. 66767**

Taylor, G. W.

AUTOMOBILE EMISSION TRENDS IN CANADA 1960-1985. *Environmental Protection Services, Ottawa (Canada), Air Pollution Control Directorate, Rept. EPS-8-AP-73-1, 55p., May 1973. 27 refs.*

The vehicle population in Canada is analyzed with respect to make-up, driving characteristics, and growth potential, with the projections being used to obtain estimates of the impact of alternative automobile emission standards on the total emissions of automobile pollutants in Canada. Maintaining the emission standards at the 1973 levels will result in a percentage decrease by 1980 as compared with 1970 levels of: 68% for hydrocarbons, 41% for carbon monoxide, and 10% for nitrogen oxides. A renewed increase in total emissions will result between 1979 and 1981 if the 1973 standards are maintained. Selection of the 1975/76 standards will result in a decrease in all pollutant levels until 1985 when the reduction from 1970 levels will be: 95% for hydrocarbons, 92% for CO, and 87% for NOx. Canadian car registrations will roughly parallel the increase in population for the forseeable future, and this increase in automobile ownership will result in an increase in total vehicle-miles travelled.

43547 **APTIC NO. 67275**

Winkler, Fred

OVERVIEW OF VEHICLE REFUELING EMISSIONS. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 1-4. (Dec. 4-5, 1973.)*

An overview of the problem of vehicle refueling emissions is presented, with particular reference to Environmental Protection Agency implementation regulations and possible future requirements for hydrocarbon vapor control. The implementation of vapor recovery control systems depends on whether the controls are placed on the filling of service station tanks, stage one, or on the filling of individual vehicle tanks, stage two, and whether the degree of control in stage two is 80% or 90%. Implementation of stage two measures can be completed by June 1976 if the required control is 80% but not until May of 1977 if a 90% control is imposed. The average service station pumps approximately 25,000 gallons of gasoline per month and in the process emits nearly 400 pounds of hydrocarbon vapor. Uncontrolled vapor losses of this magnitude by 1976 will make the service station as important a source of hydrocarbon emissions as some of the vehicles it services. Cost-effectiveness data are compared for service station controls versus onboard vehicle controls and appear quite high as compared to some of the onboard control measures.

43548 **APTIC NO. 66818**

Organisation for Economic Co-operation and Development, Washington, D. C.

ENVIRONMENTAL IMPLICATIONS OF OPTIONS IN URBAN MOBILITY. *196p., Sept. 1973. 35 refs.*

The report of the Ad Hoc Group on Motor Vehicles of the Organisation for Economic Co-operation and Development which studied automobile air pollution and noise is presented. The objectives of the study were to estimate the trends in the growth of motor vehicle emissions in urban areas; to identify and evaluate alternative approaches to reducing the levels of automotive air pollution and noise; and to examine the technology and costs of emission control; and to assess the impact of present and contemplated automotive emission control requirements on government, the economy, the users, and international trade. Among the specific topics considered are emissions controls; lead in motor fuel; health and welfare effects of automotive pollutants; ambient air quality standards; trends in autmotive emissions in urban areas; automotive pollutant concentrations in selected urban areas; the costs of emission control; inspection procedures for smoke and carbon monoxide; and traffic and parking restraints.

1972

43549 **APTIC NO. 67020**

Aiman, William R.

A CRITICAL TEST FOR MODELS OF THE NITRIC OXIDE FORMATION PROCESS IN SPARK-IGNITION ENGINES. *Combustion Inst., Pittsburgh, Pa., Symp. Combust., 14th, University Park, Pa., 1972, p. 861-868. 17 refs. (Aug. 20-25.)*

An entirely satisfactory model for the formation of nitric oxide in spark ignition engines has not yet been developed. To further elucidate the NO formation process, various quantities of pure NO were added to the intake air of a single-cylinder engine at five different air-fuel ratios. The experimental results contradicted the predictions of the equilibrium-at-peak-cycle-temperature model and the predictions of the formation-rate-controlling model. Models in which formation and decomposition processes are both important may explain the results of these experiments. The formation and decomposition processes seem to be of equal kinetic importance at the air-fuel ratio corresponding approximately to peak exhaust NO concentration (93% of stoichiometric fuel). The formation process becomes more important at leaner mixtures, and the decomposition process becomes more important at richer mixtures. In addition, a change in chemical mechanism is suggested at the stoichiometric air-fuel ratio. (Author abstract)

43550 **APTIC NO. 66817**

Ball, R. H., R. G. Salter, S. Dole, B. Frederich, M. Hammer, W. E. Mooz, R. Papetti, and G. Richards

CALIFORNIA S ELECTRICITY QUANDARY: II. PLANNING FOR POWER PLANT SITING. *Rand Corp., Santa Monica, Calif., Rept. R-1115-RF/CSA, 117p., Sept. 1972. 122 refs.*

Air pollution resulting from electric power plants in California is discussed. Fossil fueled power plants in California use only natural gas or petroleum which produce less pollutants than coal fired plants. Natural gas produces only nitrogen oxides, while oil plants also produce small amounts of particulates and some sulfur oxides. The special meteorological characteristics of California s major urban air basins and the mix of air pollutant emissions create photochemical smog to which the NOx from power plants is a significant contributing factor. Power plants contributed about 9% of the NOx emissions in the South Coast Air Basin in 1970 and 13% of the sulfur oxide emissions. There are no practical means of removing NOx from stack gases, and the potential for their reduction by control of combustion is probably limited. The total amount of NOx in the basin must be reduced to achieve satisfactory air quality, and most NOx emissions come from automobiles.

43551 **APTIC NO. 66711**

Brasser, L. J.

SOURCES OF AIR POLLUTION. *(Bronnen van luchtverontreiniging). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 13-24. 10 refs.*

The sources, dispersion, and effects of air pollution are surveyed. Domestic heating and heating in small-scale industry, public utilities, industry, motor traffic, agriculture, and horticulture are the principal sources of air pollution. Combustion processes, either in domestic heating, industry, or thermal power plants, generate sulfur dioxide and particulate matter as the chief pollutants. Here, the increased use of natural gas in place of coal and oil in the Netherlands has resulted in a considerable decrease of these emissions. Automobile traffic is responsible for hydrocarbon, carbon monoxide, nitrogen oxide, and benzopyrene emissions. A great variety of air pollutants are emitted by the different industries. Once emitted, unsaturated hydrocarbons and nitrogen oxides form ozone and peroxyacetyl nitrate in the atmosphere under the action of ultraviolet light. The dispersion of pollutants emitted from punctiform sources is largely determined by the atmospheric stability conditions, with inversion fully or partly suppressing dispersion. High pollutant concentrations may have fatal consequences as demonstrated by the examples of Donora and London. Air pollutants also may interfere with assimilation processes in plants.

43552 **APTIC NO. 67391**

Brown, Harry L., Bernard B. Hamel, Barry K. Hinkle, and William T. Schleyer

UTILIZATION ANALYSIS OF ENERGY SYSTEMS. PART III. URBAN ENERGY SYSTEM MANUFACTURING INDUSTRY DATA BASE AND ENERGY MAPS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1236-1246. 21 refs. (Sept. 25-29, Paper 729186.)*

The broad data requirements for analysis of an urban energy system are defined using the City of Philadelphia as an example. The detailed data necessary to analyze this energy system include the type (electricity, gas, oil, coal, steam), amount, density, and grade or quality of energy required by the various economic sectors (manufacturing, residential, commercial, utilities, and transportation). The urban data base of the example is established for the manufacturing industry sector in Philadelphia for 1969. An urban grid structure, composed of 364 census tracts and 12 city regions, is defined in order to develop a spatial distribution of energy density and quality throughout the city. The data for 3444 manufacturing establishments, based on standard industrial classification and representing 317 different industrial classifications, are analyzed and stored on the IBM 360 computer for general use. Total energy and energy density maps for the manufacturing sector for electricity, gas, oil, and coal are presented with a breakdown of energy consumption by major industries. Small urban areas of unique combinations of type, amount, density, and quality are defined as energy demand centers. Based only upon the manufacturing sector, a few areas of high energy density are identified; these include South Philadelphia with its associated refineries and Central Near-North Philadelphia regions. In 1969, a total energy of 2.355 times 10 to the 14th power BTU with an average density of 61,000 BTU/sq ft were used by this sector with petroleum refining and related industries representing 52% of the city total and chemical and allied products accounting for 13%. Fuel oil represents the predominant source of energy at 64%, with gas at 25% for the manufacturing sector. (Author abstract modified)

43553 **APTIC NO. 66741**

Hypr, Iija

USE OF GAS FOR DIRECT HEATING OF STEEL WITH REDUCED SCALING. *In: Sbornik Prednasek. Text in Czech. Prague, Czechoslovakia, Ustav pro Vyzkum a Vyuziti Paliv, 1972, p. 257-266, 9 refs.*

The advantages of direct heating with reduced scaling are described. An experimental furnace for direct heating and new technology were used in experiments at the Fuel Research Institute Bechovice. Fuel gas was incompletely burned in radiation burners with internal recuperation; the obtained controlled atmosphere was burned by secondary air fuel fed into the furnace by several nozzles. The method differed from most methods since when the above burners were used, neither preheated air or gas were necessary for incomplete burning. The experimental furnace of about 200 kg/hr output displayed satisfactory results for both the total efficiency (approximately 29%) and for the scaling of material which was lower than 0.5 wt%. Results of lifetime tests of materials used for some parts of the experimental furnace are mentioned.

43554 **APTIC NO. 66719**

Keller, K. J.

THE COOLING-WATER SUPPLY FOR THE POWER PLANTS IN THE NETHERLANDS IN THE FUTURE. *(Koelwatervoorziening van Nederlandse elektrische centrales in de toekomst). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/ Brussels, Intermediair, 1972, p. 245-256. 6 refs.*

Feasible cooling methods available, as well as current and future problems of cooling-water supply for power plants in the Netherlands are discussed. Cooling towers, evaporating 1 to 2% of the cooling-water supplied generate environmental problems due to water vapor release which results in fog and ice formation. The environmental load generated by cooling towers is about 100 times higher than that generated by surface coolers. Cooling towers are not expected to play any considerable role in thermal power plants in the Netherlands.

43555 **APTIC NO. 66791**

Oxtoby, R.

THE PHYSICAL AND CHEMICAL PROPERTIES OF PETROL. *School Sci. Rev., 53(184):509-519, 1972. 3 refs.*

The physical and chemical properties of gasoline are reviewed, with reference being made to the pollutants resulting from its combustion in automobile engines. Major pollutants from the internal combustion engine are carbon monoxide, lead, unburned hydrocarbons, and nitrogen oxides. Motor vehicles emit more than three-quarters of all the CO and Pb, more than half of the hydrocarbons, and almost half of the NOx polluting the atmosphere. The majority of airborne lead originates from the tetraethyl lead introduced into gasoline as an anti-knock agent. Scavengers such as dibromomethane are added to the fuel also to remove as much Pb as possible in the form of volatile lead halides via the exhaust. Cracking and reforming operations in the refinery are performed to obtain gasolines with high aromatic and branched-chain alkane contents since these compounds have high anti-knock values. The volatility of gasoline must be such that good performance is achieved without vapor lock occurring from excessive vaporization. Anti-icing additives consisting of various alcohols are used in gasoline to permit sufficient volatility without ice formation.

43556 **APTIC NO. 66782**

Stevens, J. I.

THE ROLES OF SPILLAGE, LEAKAGE AND VENTING IN INDUSTRIAL POLLUTION CONTROL. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 651-667. 17 refs. (April 20-21.)*

The role of spillage, leakage, and venting in industrial pollution control is discussed. The major role in controlling industrial pollution is to recognize and assess present plant practices. The most important causes of spillage, leakage, and improper venting are material movement problems, operational failures, equipment failures, and ineffective loss prevention programs. Selected sources and causes of leaks and spills of hazardous polluting substances are tabulated. In a priority ranking of the first 20 soluble hazardous substances the first five are phenol, methyl alcohol, cyclic rodenticide, acrylonitrile, and chlorosulfonic acid. Industrial odors are generally not a health problem but are recognized as air pollutants under the Clean Air Act. The significance of the potential for leaks and spills to create odor problems around industrial plants was developed by calculating the potential odor concentration from the emission of butyric acid at various rates. A leak of about 50 cc/hr will result in a concentration 1.5 times the threshold odor at a distance of 1 mi when the wind is blowing at 8 mph. Control procedures for spills and odors are tabulated.

43557 **APTIC NO. 66781**

Swearingen, Thomas B.

NUMERICAL SIMULATION OF A DEHYDRATOR WITH PNEUMATIC CONVEYING. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 633-650. 7 refs. (April 20-21.)*

A numerical method of modeling a dehydrator with pneumatic conveying is described. Energy and mass balances were combined in an analysis of an alfalfa dehydrator with provision for exhaust gas recirculation. Large fractions of exhaust gas recirculation and a stoichiometric air-fuel mixture gave the lowest levels of exhaust nitrogen oxides and the most economical dehydrator operation. The relatively high vapor pressure in the exhaust gas led to a proposed method of substantially reducing particulate emissions by adding a water spray to the exhaust gas stream between the primary and secondary product collection cyclones. (Author abstract modified)

1971

43558 **APTIC NO. 67299**

United Nations Economic and Social Council, New York, Committee on Natural Resources

NATURAL RESOURCES DEVELOPMENT AND POLICIES, INCLUDING ENVIRONMENTAL CONSIDERATIONS. ADDENDUM: CHANGING PATTERNS IN THE WORLD ENERGY SITUATION. *40p., 1971. 11 refs.*

NTIS: N74-18609

Changing patterns in world energy consumption and production are reviewed. Topics covered include: energy consumption in relation to economic growth; patterns of demand; production trends; energy balances; supply factors; petroleum development; natural gas; coal; oil shale, tar sands, and other sources of liquid fuels; geothermal energy; solar and wind energy; hydropower, tidal power, and nuclear energy; and electric power development. The passage of anti-pollution legislation has restricted the use of fossil fuels such as coal in heavily populated areas and has changed relative demands for various fuels.

1970

43559 **APTIC NO. 66820**

Okolowicz, Wincenty, Maria Stopa, Gabriela Przybylska, and Jerzy Boryczka

THE EFFECT OF SURFACE RELIEF AND METEOROLOGICAL CONDITIONS ON THE DISPERSION OF POLLUTANTS AS EXEMPLIFIED BY KUDOWA-ZDROJ. *(Wplyw uksztaltowania powierzchni i warunkow meteorologicznych na rozprzestrzenianie sie zanieczyszczen na przykladzie Kudowy-Zdroju). Text in Polish. Warsaw Univ. Katedra Klimatol. Pr. Stud., vol. 4:133-148, 1970. 7 refs.*

Sources and dispersion of air pollution in Kudowa-Zdroj were determined through theoretical calculations and field measurements. Emissions from the resort boilerhouse varied within the range 0.4 to 1.4 km. The cottonworks boilerhouse emits 0.35 to 0.50 mg/cu m soot and 0.25 to 0.40 mg/cu m sulfur dioxide. During certain winter days the values of maximum concentration may be much higher and the dispersion shorter. Because of the short chimney (40 m) and location of the boilerhouse, the emissions of soot and SO2 may exceed the value Q max equals 1 mg/cu m. The concentrations of soot and SO2 near the ground are extremely high and frequently exceed the maximum. The pollutant values in snow vary from 30 to 85 tons of soot sq km/yr.

1964

43560 **APTIC NO. 67335**

Onayev, I. A., A. F. Kurochkin, A. V. Tonkonogiy, and N. K. Salomatov

INTEGRATED REFINING OF BALKHASH COPPER MIXTURES BY THE CYCLONE METHOD. *(Kompleksnaya pererabotka Balkhashskikh mednykh shikht tsiklonnym metodom). Vestn. Akad. Nauk Kaz. SSR, 20(2):42-49, 1964. 7 refs. Translated from Russian. Translation Consultants, Ltd., Arlington, Va., 19p.*

The cyclone method of refining copper-bearing materials is described, and work at a semicommercial cyclone unit for smelting and refining Balkhash copper is discussed. The flue gases flow through an air preheater, a recuperator, a short coupling, an air-cooled riser, a dust collector, wet electronic filters, a scrubber, and the stack. The cyclone gas composition should be 16.5-18% carbon dioxide, 0.3-0.6% carbon monoxide, and 0.3-0.5% oxygen in order to obtain a matte containing 48-52% copper for a given mixture composition and for maximum elimination of the volatile metals. The atmosphere in the cyclone was close to optimum, but the sulfur dioxide in the flue gas was lower than expected (1.49-3.8%). Dusts in the flue gas were analyzed for composition; most of the dust was sulfate. The cyclone smelting dusts can be processed independently and metals extracted so that total extraction of copper is increased to at least 98%. By operating the process at optimum operating parameters, the copper content in the matte and waste slag can be kept optimum. Wet electronic filters are necessary in the gas scrubbing system to completely trap the valuable elements, including rare metals, when the cyclone smelting method is used.

1955

43561 **APTIC NO. 67014**

Ortgies, R. C.

A STUDY OF CUPOLA DESIGN AND OPERATING FACTORS THAT INFLUENCE THE EMISSION RATES FROM FOUNDRY CUPOLAS. *Trans. Am. Foundrymens Soc., vol. 63:741-744, May 1955.*

The emissions of pollutants from foundry cupolas are discussed. Dust loading varies considerably within a foundry. The lighter dust loadings consist basically of metallic fumes while the heavier concentration includes coarse particles of charged material picked up by the stack gases. Total dust emissions are in the range of 10 to 45 lb/ton of melt. Emission rates are influenced by bed height, charging doors, stack height, igniters, material handling, and blower air volumes.

CONTROL METHODS

1974

43562 **APTIC NO. 66618**

Akulich, S. S.

ABSORBER FOR NEUTRALIZING ACID VAPORS GENERATED IN CHEMICAL POLISHING OF GLASS. *(Absorber dlya neytralizatsii kislotnykh ispareniy pri khimicheskoy polirovke stekla). Text in Russian. Steklo Keram. (Glass Ceram.), no. 7:37-38, 1974.*

A two-stage foam type absorber for the absorption and neutralization of hydrofluoric acid vapors from the air in chemical glass polishing shops is described. The air with the acid vapors is admitted at the bottom of a vertical plate column where a foam layer is formed over the plates for intensified contact between the wash liquid (water) and the air to be cleaned. The absorption efficiency amounts to 70-80%. If the residual HF output in the cleaned air exceeds 0.3 kg/hr further purification is done in a second stage at an efficiency of 91-96%.

43563 **APTIC NO. 66948**

Altwicker, Elmar R. and Thomas T. Shen

EFFECT OF METALLIC ADDITIVES ON THE NOX-EMISSIONS FROM A SMALL OIL BURNER. *Combust. Sci. Technol., 9(1-2):61-70, 1974. 16 refs.*

The effect of metallic additives in No. 2 oil on nitrogen oxide emissions is presented based on stack gas composition. The most effective additives were manganese compounds which lowered the measured stack concentration by 20%. The data were obtained from a small oil burner and reported as a NOx-emission ratio. This ratio was studied both as a function of additive concentration and oxygen index. Although an effect of the additive on nitric oxide from fuel nitrogen cannot be ruled out, the magnitude of the decrease observed -- especially at higher oxygen indices -- cannot be explained by involving fuel nitrogen as a major source of NO. (Author abstract modified)

43564 **APTIC NO. 66651**

Amirova, S. A., R. G. Kefer, B. Y. Yagud, V. Z. Poylov, and S. V. Zekhov

STUDY OF THE JOINT ADSORPTION OF NITROGEN DIOXIDE AND CHLORINE ON MICROPOROUS SORBENTS. *(Issledovaniye sovmestnoy adsorptsii dvokisi azota i khlora na mikroporistykh sorbentakh). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii Khim. i Khim. Tekhnol., 17(7):1050-1052, 1974. 2 refs.*

The equilibrium conditions of the selective adsorption of nitrogen dioxide from its 2:1 ratio mixture with chlorine, as generated during potassium nitrate production from potassium chloride and nitric acid, were studied in laboratory tests, and a technological process for the adsorption of NO2 is proposed. Of all microporous sorbents studied, activated carbons, synthetic Nak zeolites and NK erionite, the latter was found to exhibit the highest degree of selectivity for NO2. The technological process proposed for the adsorption of NO2 from its mixture with chlorine uses synthetic erionite for adsorption. During desorption, the erionite is first blown with pure NO2 for the desorption of chlorine residues, after which thermal desorption is done, and the adsorber is finally blown with air.

43565 **APTIC NO. 67211**

Arashi, Norio and Yukio Hishinuma

APPARATUS FOR DESULFURIZATION OF EXHAUST GAS. *(Hitachi, Ltd., Tokyo (Japan)) U. S. Pat. 3,803,804. 6p., April 16, 1974. 9 refs. (Appl. Nov. 18, 1971, 7 claims).*

An adsorption apparatus for desulfurization of stack gases containing sulfur oxides is described which requires less installation space and is manufactured at less cost than similar prior art devices and which controls the exhaust gas temperature and humidity for enhancement of SOx adsorption efficiency. The apparatus consists of several desulfurization towers containing an adsorbent layer and means for selectively introducing the exhaust gases into the tower bottom for passage upwardly through the adsorbent layer. A distributor is situated in the upper portion of the lower chamber formed in the tower immediately below the adsorbent and causes liquid- gas contact between the description solution containing sulfuric acid and the exhaust gas in the tower s lower chamber. (Author abstract modified)

43566 **APTIC NO. 67257**

Atsukawa, Masumi, Yoshihiko Nishimoto, and Kazuhiro Matsumoto

METHOD OF REMOVING SULFUR OXIDE FROM GASES. *(Assignee not given.) U. S. Pat. 3,798,310. 8p., March 19, 1974. 6 refs. (Appl. Dec. 8, 1970, 14 claims).*

A solid absorbent process for removing sulfur oxides from off-gases is described which utilizes a hydrated-manganese oxide absorbent with improved SOx absorption characteristics as compared to prior art methods using the same type of absorbent. The method also overcomes the heretofore high cost of production associated with such absorbents. The off-gas is contacted with an activated hydrated manganese oxide material which is characterized by microscopic particles of string, plate, or foil shape with 4.6 or 7.18 A distance between atomic planes at maximum diffraction line strength. The formula of the hydrated manganese oxide material is MnOx-MH20, where x is between 1.5 and 1.8 and N between 0.1 and 1.0. The improved absorbent has a bulk density of from 0.337-0.625 g/cu cm and a surface area between 125 and 135 sq m/g.

43567 **APTIC NO. 66605**

Averbukh, T. D., N. P. Bakina, and N. I. Lukova

MODEL STUDY OF THE GLYCOL METHOD FOR HYDROGEN SULFIDE REMOVAL FROM GASES. *(Model nyye ispytaniya glikolevogo metoda ochistki gazov ot serovoderoda). Text in Russian. Gaz. Prom., no. 7:41-43, 1974.*

The removal of hydrogen sulfide alone or in combination with sulfur dioxide from cracking gas, the propane-propylene fraction of a petroleum refinery, and from producer gas was investigated in a model study. The glycol method was found inefficient and thus unsuitable for the removal of H2S from such gases generated in peltroleum processing, while diethylene glycol had high efficiency in pure model gas. The low efficiency for industrial gas is due to changes, such as polymerization, in diethylene glycol. An efficiency of about 90% was achieved in a disc type absorber with diethylene glycol in an underground soft coal gasification plant. The findings indicate that the glycol method is primarily suitable for gases under high pressure the contain no unsaturated hydrocarbons.

43568 **APTIC NO. 67208**

Avondoglio, Leo and George N. Shuhan

FILTER FOR REMOVING PARTICLES AND AEROSOLS FROM AIR AND OTHER GASES. *(Assignee not given.) U. S. Pat. 3,800,514. 5p., April 2, 1974. 8 refs. (Appl. April 12, 1971, 5 claims).*

A centrifugal-type air filter for removing airborne particulates is described which provides for greater efficiency than prior art similar type filters by the use of a specially shaped casing which enhances the gas flow. The casing consists of foraminous material and has a bulbous portion at the rear of the drum. The bulbous portion, aside from enhancing flow, also reduces pressure drop through the filter and permits easier removal of the residual pollutants. The velocity of the air or gas changes abruptly as it enters the rear portion thereby causing any particles which have not been filtered by the rotating filter to drop from the gas or air stream.

43569 **APTIC NO. 66972**

Barlow, G. and I. C. Sayers

FILTER FABRICS FOR DUST CONTROL. *Filtration Separation (Purley), 11(5):467-478, Sept./Oct. 1974. 3 refs. (Presented at the Fibrous Materials for the Filtration of Gases Conference, Manchester, England, April 23-24, 1974.)*

Fundamental aspects of dust collection by textiles are reviewed and discussed, including mechanisms of filtration, capture mechanisms occurring on cloths, and cake formation. The three strongest influences on particle behavior on a new or relatively new filter are inertial interception or impaction, diffusion (Brownian motion), and electrostatic forces. Types of fabric filter cleaning are described including shake collectors, reverse gas flow, reverse air pulse, reverse jet cleaning, and sonic cleaning. Theoretical considerations are then discussed, such as particle size distribution in the cake, tube entrance velocity, resistance of fabric, resistance of fabric/dust combination, design factors, dimensional stability, and moisture. The practical applications of filter fabrics in dust collection and how they may best perform their contradictory functions of capturing the maximum amount of solids while allowing the maximum flow of gas for the maximum time are also discussed. (Author abstract modified)

43570 **APTIC NO. 66828**

Batchelder, A. H. and D. I. Kline

VAPOR RECOVERY AT SERVICE STATIONS. REPORT TO THE AIR RESOURCES BOARD FROM THE TECHNICAL COMMITTEE. *California Air Resources Board, Technical Committee, 16p., April 17, 1974. 19 refs.*

Hydrocarbon vapor emission losses at service stations are examined in relation to their sources and possible measures for their recovery. The three sources of such emissions are: underground tank filling, underground tank breathing, and automobile refueling. An estimated 23 lbs of hydrocarbons are emitted at a service station for each 1000 gal of fuel sold, i.e., about 0.4%. A vapor displacement system for both filling the underground tank and filling the vehicle tank, if properly designed, can recover over 90% of the vapors displaced during each of these transfer operations. Vacuum-assisted systems with secondary vapor recovery can capture virtually all of the vapors displaced during such operations. However, standardized test procedures to evaluate control equipment and to compare the effectiveness of different approaches must be established. Also, material problems, especially in relation to the boots used on some nozzles, must be resolved along with the problem of spit-back and spillage of vapors on fuel nozzle disconnect. Diurnal tank breathing losses do not appear to be a problem since tank temperatures remain virtually constant, except for small seasonal variations.

43571 **APTIC NO. 67240**

Baum, Joerg P.

ADJUSTABLE VENTURI THROAT FOR THE PURIFICATION OF BLAST FURNACE GASES. *(Verfahrenstechnik Dr.-Ing. Kurt Baum, Essen (West Germany)) U. S. Pat. 3,799,502. 7p., March 26, 1974. 6 refs. (Appl. July 10, 1972, 6 claims).*

A venturi apparatus for the precipitation of dusts from blast furnace gases is described which, unlike prior art designs, assures sensitive control and stable dust removal even in the sonic region of gas velocities. A venturi throat is designed such that dampers of a length which corresponds approximately to half the width of the venturi throat serve to control the cross section of the throat of the venturi dust precipitator. The dampers are preferably streamlined in shape, with the narrower ends swinging in mirror images to form a nozzle curve. The ends may be adapted to form a roller-type closure when the dampers are fully closed. The lengths of the throat dampers are adjustable by means of bayonet guides. The increase of the flow in the venturi to sonic speed increases the degree of dust removal considerably and improves the size of the particles which can be separated to submicroscopic smallness.

43572 **APTIC NO. 66994**

Blair-McGuffie, M. H.

MILL DESIGN AND THE ENVIRONMENT. *Textile Inst. Ind., 12(8):231- 235, Aug. 1974. 9 refs. (Presented at the Joint Symposium on Modern Problems in Textiles, Ottawa, Ontario, Oct. 24-26, 1973.)*

A general outline of the system of combating pollution is described for textile mills in Canada. Some general considerations for improving existing mills and designing future mills are reviewed. The environmental protection scheme in Canada is regulated by the Provincial Environmental Act which defines regulations which require mills to have an approval to operate and to undergo monthly effluent checks. A vast amount of material about pollution is being published in various journals. The pollution experience of Celanese Canada, process considerations, overall mill design which affects pollution, waste disposal, waste treatment, solids disposal, and costs are described.

43573 **APTIC NO. 67249**

Block, Myron J.

METHOD OF REMOVING UNSATURATED OR AROMATIC HYDROCARBONS FROM GASES. *(Assignee not given.) U. S. Pat. 3,804,943. 4p., April 16, 1974. 4 refs. (Appl. Nov. 15, 1971, 6 claims).*

A gas filter is described which was particularly adapted for engine exhausts or for air conditioning intakes. It contains first a gas-porous bat of fibers to effect mechanical filtering of particulate matter, and a second gas-porous bat of fibers, strips, powder, or the like formed from a polymer of a perhalogenated sulfonated alkene such as perfluoroethylene sulfonic acid to effect removal by reaction with unsaturated and aromatic hydrocarbons in the effluent from the mechanical filter. This invention improves on previous methods of scrubbing intake gas to remove HC gases such as adding moisture to the atmosphere or not being very efficient. (Author abstract modified)

43574 **APTIC NO. 66683**

Boegman, N.

AIR POLLUTION: LEGISLATION AND ENGINEERING. *Certificated Engr., 47(8):147-154, Aug. 1974.*

Two approaches to air pollution control legislation are described. In the first, a maximum level for air pollution called a standard is established and the engineer is required to realize the aim by providing the means to reduce the pollution to that level. The second approach, used in South Africa, requires that the pollution be reduced to a practicable minimum, taking into account the available technology and the economic implications. The aim is not to achieve a standard but to reduce emissions continually, to values below the medical danger point. Particulate control equipment which is available in South Africa includes the fall out chamber or baffle plate inertial separator, the electrostatic precipitator, scrubbers, and bag filters. With gaseous pollutants, small volumes of off gas containing undesirable components can usually be scrubbed and the effluent treated for recirculation. With large volumes of gases, the feasibility of recovery and sale or reuse of the pollutant is considered.

43575 **APTIC NO. 67244**

Bowen, Mack D.

DEVICE FOR SEPARATING SOLID OR LIQUID PARTICLES FROM A GASEOUS MEDIUM. *(Georgia Tech. Research Inst., Atlanta) U. S. Pat. 3,802,164. 7p., April 9, 1974. 5 refs. (Appl. April 21, 1971, 8 claims).*

A device for separating solid or liquid particles from a gaseous medium in a manner similar to a cyclone separator in some respects is described. Unlike a cyclone separator, however, the device entraps and retains the separated particles in a high pressure region and is capable of removing particles down to much smaller sizes than can be obtained with conventional cyclone separation. The stream of gaseous medium with entrained particulates is introduced adjacent the top end of an elongated cylindrical container and is caused to flow helically downward along the inner wall of the container toward a contoured flow control plug at the bottom end of the container. The plug is in form of an inverted frusto-conical section surmounted by an upright, concave radiused cone which presents, below the concave cone, a high pressure region in which the particulate material is entrapped and retained. A stable and high speed vortex is formed above the tip of the concave cone and extends to an exhaust tube which projects downwardly into the chamber beyond the gaseous medium inlet. The plug also causes the gaseous medium to traverse the chamber several times before it leaves the vortex. (Author abstract modified)

43576 **APTIC NO. 66905**

Boyd, Noel F.

COAL CONVERSION PROCESSES LOOM BIG AS A SOURCE OF HYDROCARBON FUELS. *Mining Engineering, 26(9):34-41, Sept. 1974.*

Several methods of coal gasification and liquefaction are presented which produce low-sulfur fuel. The advantages and disadvantages of these methods are given in terms of capital costs, end-products, and extent of required gas clean-up. Since coal conversion requires coal preheating to some extent, all these schemes begin with a coal preparation step in a pressurized and heated reaction vessel where, in most cases, some additive or catalyst is usually injected. In principle, all processes that convert coal to synthetic natural gas must increase the hydrogen-to-carbon ratio from 0.8/1.0 in coal to 4.0/1.0 in methane. The following gasification processes are described: Lurgi and Koppers-Totzek atmospheric pressure gasifiers; the Hygas process using fluidized bed gasification; the Bi-Gas process which can gasify both caking and noncaking coal; the Synthane conversion process which can convert bituminous and sub-bituminous coals as well as lignite to high-Btu pipeline gas; the carbon dioxide acceptor process which converts lignite to pipeline gas in a fluidized bed system injected with magnesium and calcium oxides to pick up the CO2; the Hydrane process which gasifies coal directly to methane in a two-zone hydrogenation reactor; and small gasification plants using gas-water generators. The following coal liquefaction processes are discussed: The COED (char-oil-energy-development) process which converts coal to synthetic crude oil, gas, and char in four fluidized bed gasification stages; the Synthoil process which liquefies and hydrodesulfurizes coal in a specially designed packed-bed reactor; the H-Coal process which minimizes off-gas production during coal liquefaction and produces light liquid hydrocarbons and various grades of fuel oil; the Consol process which produces gasoline and other liquid hydrocarbons; and the Pamco SRC process which can yield liquid or solid fuels of low-sulfur content while recovering chemicals such as phenol and cresylic acid from off-gas.

43577 **APTIC NO. 67265**

Callahan, James L., Harley F. Hardman, and Robert K. Grasselli

ENVIRONMENTALLY SAFE DISPOSAL OF ORGANIC POLLUTANTS. *(Standard Oil Co., Cleveland, Ohio) U. S. Pat. 3,804,756. 4p., April 16, 1974. 5 refs. (Appl. June 22, 1972, 8 claims).*

Environmentally dangerous organic pollutants, such as hydrocarbons, alcohols, ethers, aldehydes, ketones, esters, acids, amines, and the like are readily disposed of in an ecologically-safe manner by entraining the organic pollutants in a stream containing at least 90% by volume of steam and passing the stream over an oxidation catalyst at a temperature of 250 to 700 C. The organic pollutants are conveniently converted to harmless nitrogen, water, and carbon dioxide and valuable high temperature steam is obtained. One of the significant obstacles to the proper disposal of these organic impurities in the past has been the extremely dilute concentration of these impurities in the waste streams. Therefore, in the preferred practice of the present invention, the impurities are entrained in steam before the reaction which concentrates the impurities. The method can be used to remove methanol and ammonia from an aqueous stream. (Author abstract modified)

43578 **APTIC NO. 67206**

Cavatassi, Dominic

SMOKE WASHER APPARATUS. *(Assignee not given.) U. S. Pat. 3,707,204. 4p., March 19, 1974. 10 refs. (Appl. Nov. 11, 1971, 5 claims).*

A smoke washer apparatus is designed such that the line of flow of smoke exhaust being cleaned is at all times in the general direction of the smokestack in order to prevent jamming of the exhaust in the flue. A series of spaced sprinkler heads is provided within a flue passageway through which water is fed by a supply pipe. The series of the sprinkler heads are so arranged in the flue as to set up an interlocking curtain of spray whose line of flow is longitudinal to the flue portion and generally in the direction of the smokestack. Contaminant-laden water gravitates to a collection tank, and the cleaned smoke is directed to the smokestack for emission to the atmosphere. The contaminant is removed from the collection tank, and the water is recycled to the sprinkler heads. (Author abstract modified)

43579 **APTIC NO. 66976**

Chandler, Geoffrey

THE OIL INDUSTRY AND THE ENVIRONMENT. *Petrol. Rev., 28(325): 22-27, Jan. 1974. 4 refs. (Presented at the Institute of Fuel Conference on Fuel and the Environment, Eastbourne, England, Nov. 1973.)*

Measures being considered by the oil industry in the United Kingdom to reduce environmental pollution caused by accidental oil spills and emissions to the atmosphere are reviewed. Sulfurous emissions are considered in particular, and the emergence of natural gas along with the increasing use of low sulfur crude oils are cited as offering promise for substantial reductions in such emissions during the next decade. The removal of sulfur from oil fractions before they are burned is offered as another possibility for reducing sulfur emissions. Well known processes exist for distillate fuels, but the treatment of residual fuels presents massive economic and engineering problems. Removal of sulfur dioxide from furnace combustion gases is also being considered, though much work needs to be done before such a solution can be regarded as widely applicable economically. Another promising method is gasification of residual fuel, oil under conditions facilitating sulfur removal from the gas which is then burned to drive a gas turbine, with the residual heat used to raise steam for turbines.

43580 **APTIC NO. 66967**

Chandrasekaran, K. and M. M. Sharma

ABSORPTION OF OXYGEN IN AQUEOUS SOLUTIONS OF SODIUM SULPHIDE. *Chem. Eng. Sci., 29(10):2130-2132, Oct. 1974. 5 refs.*

The practice of oxidizing black liquor, which contains 2-15 g/l of sodium sulfide, has been widely adopted as a partial solution to the problem of the emission of odorous compounds, such as hydrogen sulfide and mercaptans, in kraft pulp mills. Under suitable conditions of oxidation, sulfide ions can be converted to thiosulfate ions and methyl mercaptan to dimethyl disulfide. The reaction mechanism was examined in a study of the absorption of oxygen in aqueous solutions of sodium sulfide in a fully baffled 13 cm i.d. mechanically agitated contactor. The rate of absorption of oxygen increased speed of agitation up to 1500 rev/min and independent of the speed above 1500 rev/min. The oxidation of aqueous sodium sulfide at 75 C was first order in oxygen and in sodium sulfide; the value of the second order rate constant was 6170 cu cm/g mol sec. In the mechanically agitated contactor at low concentration of Na2S and higher speeds of agitation, diffusional factors could be eliminated. In industrial bubble columns, sieve plate columns, and packed columns, some diffusional resistance associated with the transport of oxygen is important. (Author conclusions modified)

43581 **APTIC NO. 66694**

Chocholac, Miroslav, Karel Rozum, Irena Hlavackova, Vaclav Masek, and Vladimir Skarabella

THE AMOUNT AND COMPARISON OF PARTICULATE MATTER EMITTED DURING WET QUENCHING OF COKE. *(Mnozstvi a slozeni tuhych castic emitovanych pri mokrem haseni koksu). Text in Czech. Hutnicke Listy, no. 8:533-538, 1974. 5 refs.*

The amount of particulate matter emitted during quenching of coke was reduced by installing baffle-type dust separators in the quenching tower. The remaining dust was then caught in four standard dust traps and its comparison and amounts determined. Four different arrangements of the wooden baffles were tested. The most efficient design used two groups of three baffles in a staggered herrinbone arrangement, forming varying angles (60, 70, 80 deg) with the chimney wall; the most favorable angle was 60 deg. A separator of this design removed 55.12% of the total fly ash, and 82.75% of the particles below 5 micron diameter, i.e., the fraction that is most injurious to the public health. In addition to the obvious hygienic benefits, these dust separators are also very economical because the commercial value of the coke recovered in one year exceeds their installation costs.

43582 **APTIC NO. 66930**

Davies, G. M.

TRANSPORTATION OF IRON ORE. A PRACTICAL EXERCISE IN ENVIRONMENTAL CONTROL. *Ann. Occupational Hyg., 17(1):41-48, 1974.*

Preliminary wind tunnel tests and full scale field trial runs were conducted with iron ore trains and trucks loaded with a variety of ores to examine factors affecting iron ore blow-off. The preliminary trials indicated that certain ores could be expected to result in dust pollution; hence, full scale trials were conducted with the dustiest ores to examine the effect of treatment and loading properties. The critical wind speed effecting blow-off was 40 mph. Both rainfall and high humidity appeared to reduce the problem. Three forms of spray treatment, using either a latex solution, a bituminous emulsion, or water, all proved successful in controlling the dust blow-off. Ore moisture contents as measured by a nucleonic gauge did not appear to be significantly related to losses.

43583 **APTIC NO. 67202**

Deane, Clifford T.

AIR CLEANER. *(Vortex Air Corp., Dunbar, W. Va.) U. S. Pat. 3,802,162. 5p., April 9, 1974. 14 refs. (Appl. April 17, 1973, 8 claims).*

An air filter for removing mists, dusts, fumes, smoke, and other types of particulates from indoor atmospheres is designed such that it requires no duct work and has no bags or filters that need replacement. Dust-laden air into which water is sprayed is drawn through a two stage impeller assembly to impart vortical movement to the air mass in an axial flow stream causing centrifugal separation of the more dense components from a radially inner portion of the flow stream that is discharged. A venturi tube section accelerates axial flow between the impeller stages. The separated contaminants in the air are collected as a slurry from annular spaces into which the slurry enters through baffle flow paths. (Author abstract modified)

43584 **APTIC NO. 66616**

Descolas, M.

THEORY AND USES OF ELECTROSTATIC PRECIPITATORS. *(Les electrofiltres. Theorie et domaines d application). Text in French. Tech. Moderne, no. 1:51-62, Jan. 1974.*

Factors influencing the efficiency of electrostatic precipitators, and the principal uses of this type of dust separator are reviewed. The counter-ionization caused by very high resistivity of the dust can be avoided theoretically by increasing the temperature. The resistance of the settled dust layer is determined not only by the inherent resistivity of the dust but also that of impurities adsorbed by the dust particles, such as water vapor and sulfur dioxide, which tend to decrease the resistance. The maximum possible current intensity decreases with increasing temperature. The current intensity decreases with increasing dust concentration in the waste gas. Electrostatic dust precipitators are successfully used in thermal power plants, waste incinerators, open-hearth furnaces, and oxygen converters. In the pulp industry, they are used to recover sodium sulfate and carbonate between the soda lye boiler and the economizer.

43585 **APTIC NO. 67229**

Dyre, Morgens

AIR TREATMENT EQUIPMENT. *(Danfoss A/S, Nordborg (Denmark)) U. S. Pat. 3,799,250. 4p., March 26, 1974. 6 refs. (Appl. June 30, 1971, 4 claims).*

An air treatment apparatus which utilizes a heating element to eliminate airborne bacterial spores and odorous substances is described which, unlike prior art devices of its type, utilizes a heat exchanger to reduce the temperature of the outflowing air. The air to be treated is caused to pass over a silicon carbide heating unit coated by a thin layer of catalyst material which operates at a temperature of 200-300 C. Airborne particles passing over the element are decomposed to odorless substances. A heat exchanger arrangement consisting of tubes which are situated in the air passage and which extend parallel with the longitudinal run of thhe heating element reduces the temperature of the heated air returned to the room or space from which the air was withdrawn.

43586 **APTIC NO. 66789**

Evans, R. J.

POTENTIAL SOLID WASTE GENERATION AND DISPOSAL FROM LIME AND LIMESTONE DESULFURIZATION PROCESSES. *Bureau of Mines Information Circ., no. 8633, 25p., 1974. 15 refs.*

The generation and disposal of solid waste from electric utility plants using a lime or limestone wet-scrubbing system for sulfur dioxide removal and the potential effects of such waste generation on the environment are estimated for 1975 and 1980. Approximately 5.8 million tons of desulfurization solid wastes (50% solids) is estimated to occur by 1975 and 71.4 million tons by 1980, the latter figure being enough to cover about 5.8 sq mi at a depth of 20 ft. The desulfurization waste material when combined with lime, fly ash, and water may have potential for use as a roadbase material, landfill reclamation, and synthetic aggregate; conversion of the waste material appears to be adaptable to both new and retrofitted coal-fired power plants. (Author abstract modified)

43587 **APTIC NO. 67204**

Fisher, David

FUEL SYSTEM OF INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,797,468. 5p., March 19, 1974. 11 refs. (Appl. Aug. 29, 1972, 4 claims).*

A device for enhancing fuel vaporization in internal combustion engines and hence reducing fuel consumption and harmful exhaust emissions differs from prior art devices of its type in that heat is directly supplied to the fuel and air mixture rather than to the intake manifold. A heat exchanger is incorporated between the carburetor and the inlet manifold and is preferably connected to the engine s cooling system. An auxiliary air bleed is provided upstream of the heat exchanger to convert vaporized fuel into a fog to further enhance efficient combustion. An electric heater may be used to provide for operation of the heat exchanger when the engine and its cooling medium are cold. (Author abstract modified)

43588 **APTIC NO. 66681**

Fishman, B. D. and M. E. Valov

REDUCING THE CONTAMINATION OF THE AIR BY DUST AND GASES IN THE MANUFACTURE OF METAL POWDERS FROM MELTS. *Soviet Powder Metallurgy and Metal Ceramics (English translation from Russian of: Poroshk. Metall.), 13(4):333-335, April 1974. 3 refs.*

The control of dust and gaseous pollutants produced in the manufacture of metal powders from melts is discussed. Escaping pollutants vary greatly in temperature, chemical composition, and particle size. Parts of existing ventilating and dust fume extraction systems were modified in a plant and some new units were provided. The dry screening process which produced an exceptionally large amount of dust (115 mg/cu m) was altogether eliminated. Dust was reduced from the melting furnace from 11.2 mg/cu m to 2.4 mg/cu m, from the on bridge crane level from 18 mg/cu m to 9.5 mg/cu m, and from the drying furnace from 321 mg/cu m to 10.9 mg/cu m. The carbon monoxide concentration was reduced from 0.031 mg/l to 0.012 in the melting furnace, from 0.037 to 0.018 in the on bridge crane level, and from 0.038 to 0.009 in the drying furnace.

43589 **APTIC NO. 67231**

Flux, J. H.

CONTAINMENT OF MELTING SHOP ROOF EMISSIONS IN ELECTRIC ARC FURNACE PRACTICE. *Ironmaking Steelmaking, 1(3):121-133, 1974. (Presented at the International Iron and Steel Institute Symposium on Environmental Control in the Steel Industry, Tokyo, Feb. 18-22, 1974.)*

Design details and costs are given for air pollution control systems developed for five melting shops where fume generated during steelmaking cycles was escaping from furnaces and eventually finding its way to the atmosphere through ventilation systems. Measurement trials extending over 15 mo at one melting shop containing four 7.32 m diameter furnaces are used as the basis for the specification of a system to extract 45,075 cu m/min of air and fume before filtration in a bag house. Effective capture area for hoods installed over the furnaces is 28.5 by 15.9 m, with the full length of each hood being covered by offtakes. A vane type of control damper is fitted where the offtakes enter the ducting. Cross drafts are eliminated by extending vertical sheeting for the full length of the melting shop, blocking off jack roofs in both bays at either end of each hood, and arranging for doors to be fitted to four large openings in the sides of the shop. An air to cloth ratio of 1.70 cu m/min sq m is employed for terylene weave filter bags which are subjected to both fumes particulates and sulfur dioxide gases.

43590 **APTIC NO. 67201**

Foltz, Donald R.

AEROSOL COALESCING FILTER AND THE LIKE. *(Hankinson Corp., Canonsburg, Pa.) U. S. Pat. 3,802,160. 7p., April 9, 1974. 6 refs. (Appl. May 17, 1972, 20 claims).*

A filter capable of coalescing and removing aerosols contained in an air or gas stream is described which, unlike prior art filters, does not require initial compression between rigid support members to stabilize the filter media. The filter is provided with a single support member to promote structural simplicity and to reduce differential pressures across the filter. An inner layer of flexible foraminous material exerts a gentle pressure on the filtering media, and this small but uniform pressure serves as dimensional stabilization, ensuring the structural integrity of the filtering media under varying operating conditions such as variations in aerosol saturation and air flow. The filtering medium is arranged with a high ratio of voids in further mitigation of differential pressures.

43591 **APTIC NO. 66991**

Friedrich, Gerhard and Guenter Kreher

USE OF BIOLOGICALLY PURIFIED PROCESS WASTE WATER IN WET DUST COLLECTORS. *(Einsatz von biologisch gereinigten Prozessabwaessern in Nassentstaubungsanlagen). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 127-132.*

Waste water from pressure gasification and production of lignite high temperature coke undergoes biological purification and is then fed to a wet dust collector. Harmful water pollutants such as phenols and ammonia are adsorbed to a large extent by the dust particles thus replacing a further water purification stage. In addition the collection efficiency of the wet collector is improved. Experiments with fresh water in the dust collector yielded an average fly dust content of the cleaned gas of 0.172 g/cu m and with biologically purified waste water of 0.127 g/cu m, which means that 26.2% less fly dust is carried off into the atmosphere. The process is patented and has been tested in full-scale plants. It has been in use since 1967.

43592 **APTIC NO. 67210**

Gelhaar, Rolf, Juergen Nitz, and Kurt Rau

ELECTROSTATIC PRECIPITATOR. *(Metallgesellschat Aktiengesellschaft, am Main (West Germany)) U. S. Pat. 3,803,809. 6p., April 16, 1974. 11 refs. (Appl. July 11, 1973, 8 claims).*

An electrostatic precipitator is described in which thermal distortion of the outermost electrode strips resulting from flameless combustion phenomena is minimized in comparison to prior art electrostatic precipitators. The apparatus consists of several collector partitions subdividing the space within a housing into several flow chambers. The partitions are formed by upright electrode strips having lateral edges which are hooked together loosely in the normal positions of these electrode strips. The electrodes may forcibly engage one another to prevent distortion of th partition upon thermal deformation of the strips. The outermost strips are provided with rigid profile support members which are hooked around the edges of the outermost strips throughout the height thereof. (Author abstract modified)

43593 **APTIC NO. 67255**

Goto, Kenji and Kiyohiko Mizuno

EXHAUST GAS RECYCLING SYSTEM. *(Toyota Jidosha Kogyo Kabushiki Kaisha, Aichi-Ken (Japan)) U. S. Pat. 3,800,764. 5p., April 2, 1974. 2 refs. (Appl. Sept. 5, 1972, 4 claims).*

An exhaust gas recycling system for reducing nitrogen oxide emissions from motor vehicle internal combustion engines is described which unlike prior art devices of its kind reduces the NOx produced even when the engine load is suddenly increased. The device has an intake system for introducing a fuel-air mixture into the engine, an exhaust system for discharging exhaust gases from the engine to the atmosphere, and a recycling pipe connected to both the intake and exhaust system for recycling exhaust gases. A device for modifying the volume of the recycling exhaust gases is provided and is responsive to changes in the pressure of the intake manifold of the inlet system. An intake manifold pressure sensor incorporates a diaphragm positioned in a chamber and a device for retarding the propagation of pressure from thye intake manifold to the diaphragm chamber. An induction pipe is connected to both the intake manifold and the diaphragm chamber.

43594 **APTIC NO. 66965**

Gregory, D. P.

HYDROGEN - ENERGY OF THE FUTURE. *(Wasserstoff - Energie der Zukunft). Text in German. Gas Waerme Int., 23(8):311-315, Aug. 1974. 10 refs.*

A review of the feasibility of using hydrogen as an energy source is presented, with reference being made to its environmental advantages, questions concerning the production and distribution of the gas, cost factors, applications, and safety aspects. Hydrogen is cited as having the smallest environmental impact of all energy sources since its combustion produces the smallest amount of air pollution. The only combustion product is water which can be discharged to the environment in unlimited quantities without producing any adverse effect on the ecology. An energy supply industry based on hydrogen appears technologically feasible today.

43595 **APTIC NO. 66990**

Griesche, Guenter and Heinz Krause

SAFETY MEASURES PREREQUISITE FOR THE REDUCTION OF THE DUST EMISSION FROM BRIQUETTING PLANTS BY RECYCLING DUST-CLEANED AIR. *(Sicherheitstechnische Voraussetzungen fuer die Senkung der Staubemission von Brikettfabriken durch Weiterverwendung der Entstaubungsabluft). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 115-126. 3 refs.*

Large quantities of dust-laden vapors and air flows develop in briquetting plants at the drying of coal, transport, cooling, and subsequent pressing. They are cleaned in electrostatic precipitators and combined dry and wet dust collectors. Despite improvements of the collection efficiency of the dust collectors the cleaned gases still carry dust concentrations into the atmosphere which can no longer be tolerated. The dust cleaned waste air is therefore recycled and used in the dryers. To avoid possible dust explosions in the recycling pipes a flame barricade has been developed. It consists of a casing with inserted sheet steel lamellas. Lamella packages with a length of 550 to 660 mm are capable of extinguishing the flames from soft coal dust explosions in pipes of small as well as of larger diameter. A 3mm spacing of the lamella was most suitable for the purpose. These flame barricades do not lead to congestion. From time to time they must be washed.

43596 **APTIC NO. 66950**

Gruden, Dusan and Karlheinz Lange

OPERATING PROPERTIES AND EXHAUST GAS EMISSION OF A COMBUSTION ENGINE WITH THE PORSCHE DIVIDED CHAMBER SYSTEM. *(Betriebsverhalten und Abgasemission eines Verbrennungsmotors mit dem Porsche-Schichtlade-Kammer-System). Text in German. Motortech. Z. (Stuttgart), 35(10):307-313, 1974. 17 refs.*

Efforts to reduce the emission of undesirable exhaust gas components without raising fuel consumption led to the development of the Porsche stratified charge system with divided combustion chamber. A lean mixture is supplied to the main combustion chamber which is connected with a second combustion chamber through a small duct. A rich mixture is produced in the second chamber which is equipped with an injection nozzle or an additional valve for this purpose. The ignition chamber is attached to the second combustion chamber. The fuel is directly injected into the main combustion chamber. The stratified charge is produced with the aid of the second chamber. As experiments with the single-cylinder test engine and with an automobile engine with several cylinders have shown, the combustion process is marked by a very stable operation over a wide range of fuel-to- air ratios. Design parameters such as ignition timing and lambda have a far smaller influence on the fuel consumption and exhaust gas emission than with the comparable Otto engine. This makes the regulation of the stratified charge engine with divided chamber easy. The described system emits somewhat less carbon monoxide and hydrocarbons than the Otto engine and considerably less oxides of nitrogen with aobut the same fuel consumption as the conventional Otto engine.

43597 **APTIC NO. 66989**

Haenssgen, Tilo and Christian Merkel

OPERATING EXPERIENCES WITH ELECTROSTATIC PRECIPITATORS BEHIND SOFT COAL-FIRED STEAM BOILERS. *(Betriebserfahrungen mit Elektroabscheidern hinter braunkohlegefeuerten Dampferzeugern). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 109-114.*

For larger boiler units the horizontal electrostatic plate precipitator is used exclusively. It is capable of cleaning enormous quantities of gases. Through longer plates of 12.5 m space consumption is reduced by this precipitator. The cleaning system for ionizing and collection electrodes has been greatly improved. The most influential parameters among the processes inside the electrostatic precipitator are gas velocity, gas temperature, and gas composition as well as the specific electric dust resistance, the dust concentration, and particle size. A detailed discussion of the influences of these parameters on the operation of the precipitator results in a list of requirements which must be fulfilled in order to maintain an optimum dust removal process. They include the maintenance of constant temperature conditions with a safe temperature difference between gas temperature in the precipitator and the dew point temperature, achievement of complete combustion and of a continuous and controllable ash tap-off, and regular maintenance and recording of the availability of the precipitator.

43598 **APTIC NO. 66665**

Higuchi, Kozo

ADSORPTION DEODORIZATION SYSTEM. *(Kyuchaku dasshu sochi ni tsuite). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):13-15, Aug. 1974.*

A general discussion is given of an adsorption deodorization system, including three types of deodorizers and two types of deodorization apparatuses. A brown spherical product of 4 to 10 mm in diameter consisting chiefly of ferric oxide, called LmN, is used for the adsorption of hydrogen sulfide and acidic gases. The mechanism of adsorption is neutralization and salt formation. Estan G is a mixture of sulfonated charcoal, nitrofumic acid, and other compounds. It is used for the adsorption of ammonia and other alkaline gases such as amines. The mechanism of adsorption is also neutralization and salt formation. Activated carbon is prepared by treating carbon material with steam and combustion gases at 900 C, by which porous material is formed through hydrogen gas reaction. Activated carbon generally possesses a 100 sq cm interior surface area/g and is used for the adsorption of nonpolar substances. The adsorption deodorization apparatus for indoor ventilation-deodorization requires only a an adsorbing tower, a blower, and an odor duct. The capacity ranges from 10 cu m/min to 2000 cu m/min. An apparatus for deodorizing exhaust gas from a dryer is usually used accompanied with washing towers for the removal of dust and adhesive substances. The advantages of the adsorption deodorization apparatus are low cost and simple structure.

43599 **APTIC NO. 66593**

Houbaut, J.

AIR FILTRATION BY BAG FILTERS. APPLICATION TO CARBON BLACK. *(La filtration de l air sur les manches en tissu. Application aux noirs de carbone). Text in French. Revue Gen. Caout. Plast., 51(6):429-432, 1974.*

Problems and possibilities of the use of bag filters for the capture of carbon black in rubber manufacture are described. For efficient collection, the air exhaust openings should be placed as close as possible to the emission sources, and adequately high flow rates should be provided for. Both tissue and felt can be used as materials for bag filters for carbon black separation at efficiencies reaching up to 99.9%. The filter efficiency is improved by the formation on the inside of a layer separated by such forces as Brownian movement, inertia, electrostatic effect, impact, interception, fiber effect, or gravity. Dedusting is possible by mechanical knockoff of the bags, a vibration system, air counterflow, or periodical shock waves of air. The use of synthetic fibers such as Nylon, acryl fibers, Nomex, and Teflon, as of glass fiber has extended the use of bag filters to higher temperature and aggressive gases.

43600 **APTIC NO. 67220**

Hull, Francis R.

EXTENSIBLE INCINERATOR GAS SCRUBBER SYSTEM WITH STANDARD DUCTWORK. *(Assignee not given.) U. S. Pat. 3,800,511. 14p., April 2, 1974. 9 refs. (Appl. March 9, 1973, 7 claims).*

An ejector-venturi gas scrubber unit for reducing combustion product emissions from waste incinerators is described which differs from prior art devices of similar nature in that no additional ductwork is required for its installation. Height- adjustable gas washer units provide an extensible foundation for a standard system of inlet, bypass, and discharge ductwork wherein the furnace intake of the scrubber system may be easily installed in a sheltered position adjacent the refractory furnace ceiling of apartment house incinerators having different designs and furnace heights. The extensible arrangement eliminates the need and expense for individual custom-type fit-up and fabrication of scrubber system ductwork as commonly practiced by installers. (Author abstract modified)

43601 **APTIC NO. 66669**

Ibana, Hideya

DEVELOPMENT OF CATALYTIC REDUCTION METHODS. *(Sesshoku kangenho no kaihatsu). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), p. 1-18, 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

Catalytic reduction methods, nonselective methods, selective methods, and the application of theory to actual system are discussed. In the nonselective catalytic reduction method, oxygen reacts prior to or simultaneously as nitrogen oxides do, and this requires 10 to 100 times the quantity of reduction agent required for a selective method. But the reaction between the reduction agent and oxygen means combustion and creation of thermal power. Therefore, the use of this heat is not necessarily disadvantageous. It is reported that only 20% of the 50 nitric acid synthesis tail gas treatment systems presently functioning in the United States actually reduce NO2 to nitrogen; the rest reduce it only to NO. When heat recovery is possible, the cost of nonselective reduction is about the same as selective reduction; but when this system is adopted to already operating factory, the balance of supply and demand is difficult to achieve, especially when the residue oxygen is large. For instance, the treatment of sintering plant emissions containing 12-18% oxygen recovers steam in the amount equivalent to that required by a power plant with several hundred thousand KW power production. The problem of catalyst deterioration by sulfur oxide in the stack gas, and the popular misconception of simultaneous treatment of NOx and SOx are discussed.

43602 **APTIC NO. 67241**

Inoue, Tokuta and Shunzo Yamaguchi

EXHAUST EMISSION CONTROL DEVICE. *(Toyota Jidosha Kogyo Kabushiki Kaisha, Aichi-ken (Japan) and Nippon Denso Kabushiki Kaisha, Kariya-shi (Japan)) U. S. Pat. 3,797,240. 5p., March 19, 1974. 7 refs. (Appl. Feb. 2, 1972, 5 claims).*

A flame afterburner for reducing internal combustion engine emissions is described which overcomes problems of incomplete oxidation during automobile warm-up and fluctuations in combustion during rapid acceleration in contradistinction to prior art afterburners. The apparatus consists of an oxidation reaction chamber connected to the exhaust manifold of the engine and a vortical combustion chamber which receives a supply of secondary air and secondary fuel for vortical flame afterburning. The vortical flames are blown from the combustion chamber into the oxidation reaction chamber so as to subject the unburned exhaust components to recombustion. A portion of the vortical combustion chamber extends into the oxidation reaction chamber so that the exhaust gases introduced into the oxidation reaction chamber may be brought into direct contact with the outer wall surfaces of the vortical combustion chamber. Fuel vaporizers facilitate vaporization of the secondary fuel in the vortical combustion chamber.

43603 **APTIC NO. 66641**

Isako, Rentaro, Noboru Kato, Kiyokatsu Morita, and Takaaki Ikeda

COLLECTION METHOD FOR SUBMICRON PARTICLES AND HARMFUL GASES IN SI GROUP ELECTRIC FURNACE WASTE GAS. *(Si-kei denkiro haigasuchu no sabumikuron ryushi oyobi yugai gasu no hoshu hoho). Text in Japanese. (Ibigawa Electric Industries, KK., Ogaki City, Gifu Prefecture (Japan)) Japan. Pat. Sho 49-31428. 2p., Aug. 21, 1974. (Appl. June 26, 1970, 1 claim).*

This process is concerned with the collection of submicron-sized particles which are emitted in the exhaust gas from electric furnaces. The high temperature exhaust gas is led to a spray tower, where the gas is mixed with water droplets (300-1500 micron in size) containing some alkaline material such as calcium hydroxide. The ratio of water vapor to exhaust gas ranges from 0.5-8 l/cu m. This vapor mixture is conducted to a rotary disk vapor dust collector operating at a speed of 20 m/sec to 60 m/sec. The vapor mixture is reduced to 100-500 micron in size, and the ratio of water vapor to exhaust gas becomes 1-5 l/cu m. At a temperature of 400 C, the efficacy of this vapor mixture in trapping sulfur dioxide gas and dust particles is nearly 100%.

43604 **APTIC NO. 66898**

Ishii, Naojiro

THE USE OF ETHANOL AS FUEL. *(Nenryo to shite no etanoru no riyo). Text in Japanese. Doryoku (Nihon Doryoku Kyokai Kaiho) (J. Japan Power Assoc.), 24(29):28-31, Jan. 1974. 10 refs.*

The performance capacity of ethanol as an automobile fuel, its consistency, and the mixture of ethanol and gasoline as a fuel, are discussed. According to a previous report on the hydrocarbon contents in ethanol gasoline and regular gasoline, the hydrocarbon emission quantity depends on the engine rotation speed; both fuels emit large quantities of HC at low speeds, and the amount drastically decreases; but under any driving condition, the amount of HC is rather small with ethanol. The amount of nitrogen oxide in exhaust gas is greater with ethanol gasoline when the air-fuel ratio is not adjusted; but based on the theoretical mixture ratio, the difference between the two types of fuel is very small. Therefore, ethanol does not particularly contribute toward the reduction of NOx emission.

43605 **APTIC NO. 66619**

Ito, Osamu and Hiroshi Saito

EXAMPLES OF NEW ELECTROSTATIC PRECIPITATORS. *(Atarashii denki shujin sochi no jitsurei). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 11-17, 1974. 6 refs. (Presented at the Symposium on Practical Problems in Factory Dust Collection Systems, Tokyo, Japan, July 5, 1974.)*

The large spacing-type and hybrid-type electric precipitators are described. The large spacing type was developed to increase collecting efficiency on high resistance dust by increasing the space between the two electrodes from the conventional 100-175 mm to 200-500 mm. This electric precipitator was used in a clinker cooler. Dust from cement kilns contains very little moisture and sulfur trioxide and is high in electric resistance. Exhaust gas from a clinker cooler at 2300 N cum/hr and 150-250 was treated with a large spacing precipitator, and the dust content was reduced from 9.73 g/N cu m to 0.014 g/N cu m. A high voltage power supply (75-200 kv) is required for this apparatus. A hybrid type was designed to increase collection efficiency on high dust concentration gases. This type of precipitator consists of dry electrodes and water film on the last electrode. More than 90% of the dust is collected on the dry electrode, and the rest is removed by the wet electrode. Dust collected by the water film was removed as a slurry which was dried by incoming gas. Application of the hybrid type precipitator in cement and chemical plants showed a dust collecting efficiency of higher than 99% on gas containing more than 25 g/N cu m of dust.

43606 **APTIC NO. 67258**

Kadotani, Kenzo, Tokio Isogai, Yasushi Miyano, and Katsuhito Suzuki

HIGH-SPEED ROTATION DRUM FOR USE WITH A CENTRIFUGAL SEPARATOR FOR GASEOUS MIXTURE. *(Hitachi, Ltd., Tokyo (Japan)) U. S. Pat. 3,797,737. 10p., March 19, 1974. 8 refs. (Appl. Sept. 10, 1971, 11 claims).*

A high-speed rotation drum for use in centrifugally separating uranium hexafluoride from gas mixtures is described which achieves higher peripheral speeds than prior art drums and possesses greater tensile strength in the circumferential direction. The drum is a composite of two drums, one disposed on the outer periphery of the other. The inside drum is made of a corrosion resistant metal such as extra super duralmin, while the outside drum is made of a plastic material reinforced with a large number of fibers wound and extending circumferentially. The outer drum is composed of several ring-like members, each being shorter than the inner drum part, to simplify manufacture of the device. The plastic material of the outer drum is of the carbon fiber type.

43607 **APTIC NO. 67243**

Kalen, Bodo

GRANULAR BED FILTER APPARATUS AND METHOD. *(The Ducon Co., Inc., Minneola, N. Y.) U. S. Pat. 3,708,882. 8p., March 26, 1974. 7 refs. (Appl. Sept. 28, 1971, 12 claims).*

A granular bed filter, which is particularly adapted for purification of high temperature flue gases which may have been precleaned by cyclones but still contain fine particles, utilizes narrow filter beds capable of being more efficiently backwashed than prior art devices of similar nature. The apparatus contains several hollow filter stacks, each stack being provided with its own backwash nozzle and independently backwashed when required. Each filter stack also includes a series of annular filter beds which are of narrow width and receive inert granular filter material such as sand. Backwashing is preferably accomplished using a post jet high pressure technique wherein air at high pressure is introduced into the filter stack to induce the plenum air to fluidize the filter bed. Air pressure for backwashing is preferably between 150 and 200 psi for a bed having approximately 4 lbs of No. 0.5 sand in each filter compartment. The gas to be treated is introduced radially into the hollow stacks by way of an inlet screen.

43608 **APTIC NO. 66624**

Kanematsu, Sado

THE PRESENT STATE AND FUTURE PROBLEMS FOR MAINTENANCE AND MANAGEMENT OF HIGH TEMPERATURE BAG FILTERS. *(Koonyo baggu firuta no hoshu kanri no genjo to kongo no mondai). Text in Japanese. Preprint, Japanese Society for Chemical Engineering, p. 18-25, 1974. (Presented at the Symposium on Practical Problems in Factory Dust Collection Systems, Tokyo, Japan, July 5, 1974.)*

A dry type bag filter for treatment of high temperature exhaust gas from a fiber glass plant is described. The exhaust gas contains fluorides, sulfur trioxide, soot, and other components. Exhaust gas is cooled from higher than 750 to 250 deg and powder absorbent is added. The resulting gas is then introduced to a bag house and dust is reduced to 0.001 gr/N cu m and fluoride to less than 2 ppm. Exhaust gas must be cooled to a temperature below the limit applicable to the filter cloth. An individual bag ranges from 130 mm in diameter, 3 m long, to 300 mm by 10 m. A reverse-pressure dumper is used to remove dusts on the filter bag. The suitable tensile strength of the bag is 15 kg for the small size and 35 kg for the large size. The future problems include improvement of mounting method of the bag, development of new bag cloths using special treating agents, and increasing velocity of filtering air. By increasing air velocity the scale can be reduced, thus the cost is minimized.

43609 **APTIC NO. 66854**

Kant, F. H., R. P. Cahn, A. R. Cunningham, M. H. Farmer, W. Herbst, and E. H. Manny

FEASIBILITY STUDY OF ALTERNATIVE FUELS FOR AUTOMOTIVE TRANSPORTATION. VOLUME I - EXECUTIVE SUMMARY. *Exxon Research and Engineering Co., Linden, N. J., Office of Air and Waste Management Contract 68-01-2112, Rept. EPA-460/3-74-009-a, 23p., June 1974.*

NTIS: PB 235581/AS

Feasibility study results are presented on practical alternatives to automotive fuels derived from petroleum for the 1975-2000 time frame. The alternative fuels considered are gasoline and distillate types from oil shale and gasoline, distillate, and methanol types from coal. It appears feasible to make petroleum type fuels from coal and oil shale, and initial production of such fuels is likely within the next 5-7 years. Automotive fuel components from coal and oil-shale will be blended with petroleum fractions. Methanol from coal is a feasible automotive fuel for spark-ignition engines, gas turbines, and fuel cells, though spark-ignition engines will require engine and vehicle modification for optimum performance. Synthetic fuel production from coal and oil shale will make only a minor contribution to automotive fuel supplies in 1985 but has the potential for becoming a major factor by the year 2000. Following an initial period of high cost, synthetic fuels from coal and shale are expected to decline and then eventually rise over the long term due to depletion. Information is very limited on exhaust emissions for the alternate fuels, though coal and shale-derived hydrocarbons are expected to result in emissions similar to petroleum fuels.

43610 **APTIC NO. 66649**

Klotz, F. and H. U. Wanner

THE EFFECT OF AIR CLEANING APPARATUSES ON THE QUALITY OF INDOOR AIR. *(Die Wirkung von Luftreinigungsapparaten auf die Qualitaet der Raumluft). Text in German. Zentralbt. Bakteriol. Hyg. Infektionskr. Abt. Orig. A, 227(1-4):559-563, 1974.*

The collection efficiency of two kinds of indoor air cleaning apparatuses for dust, germs, aliphatic aldehydes and carbon monoxide was examined. The first unit drew the air through four filters, a filter for collection of coarse dust, an electrostatic precipitator, a polyurethane and an activated cola filter. The second unit drew indoor air through fiber filter mats and then pressed it through a wet fiber mat on a rotating drum dipping into a water basin. The results showed that the two cleaning units had an entirely different effect. The first unit equipped with the electrostatic precipitator reduced mainly particulate matter and microorganisms, while the second unit reduced the aliphatic adlehydes somewhat. Both units had no measurable influence on the carbon monoxide concentration.

43611 **APTIC NO. 66696**

Kobayashi, Masahiro, Hisato Yano, Susumu Oikawa, and Eiji Miyaji

AIR CLEANING PLANS FOR OFFICE BUILDINGS (REPORT NO. 1). *(Jimusho biru no kiki seijo keikaku. (Dai-1-po)). Text in Japanese. Shimizu Kensetsu Kenyushoho (Rep. Res. Lab. Shimizu Constr. Co., Ltd.), no. 22:79-85, April 1974. 4 refs.*

The large scale air cleansing system for office buildings was tested and its efficiency was evaluated. As a preliminary investigation, the concentrations of sulfur oxides, nitrogen oxides, and carbon monoxide inside and outside of the building were measured. Generally, the pollutant concentration inside of the building tended to increase with the increase in outside pollutant concentration. The type of air cleansing system, the wet method and dry method, the installation location of the air cleansing system, the air intake system, and the circulation system are discussed from the standpoint of design. Three types of filter compositions and the calculation method for the required removal rate are described. The variation in pressure loss depending on the type of adsorbent and the durability of adsorption filter are also discussed. After the installation of the air cleansing system, the one-year average removal rate of SOx was 83.3%, the removal rate of suspended particulates was 39.1% and the removal rate of NOx was 84%.

43612 **APTIC NO. 67214**

Kobylinski, Thaddeus P. and Brian W. Taylor

PROCESS FOR REDUCING THE CONTENT OF NITROGEN OXIDES IN THE EXHAUST GASES FROM INTERNAL COMBUSTION ENGINES. *(Gulf Research and Development Co., Pittsburgh, Pa.) U. S. Pat. 3,801,697. 5p., April 2, 1974. 8 refs. (Appl. March 2, 1972, 20 claims).*

A method for the reduction of nitrogen oxides in internal combustion engine exhausts to nitrogen is described. The process involves contacting the exhaust gas at an elevated temperature of at least 680 F in a reducing atmosphere with about 0.0001-0.5 troy ounce of rhodium and about 0.0001-0.5 troy ounce of ruthenium per 1000 cu ft of exhaust gas per hour. The catalysts used can be unsupported and in substantially pure form, but in a preferred embodiment they are distended on a support. The amount of combined catalyst, calculated as metal, on the support can be from about 0.01-10% by weight of the support and is preferably between 0.05-1% by weight of the support.

43613 **APTIC NO. 67264**

Koistinen, O. A.

BIOLOGICAL REDUCTION OF ODORS IN KRAFT PULP MILLS. *(Reduction par voie biologique des odeurs d usines de pate au sulfate). Text in French. ATIP, 28(7):329-331, 1974. 1 ref.*

The biological decomposition of malodorous compounds in gaseous and liquid wastes generated in kraft pulp mills was studied. The malodorous compounds in gases and liquids were treated in separate biological trickling filters filled with waste bark with rich microbial flora. The rate of odor reduction was determined to be higher than 90%, while the rate of reduction of the BOD content in wastewater ranged from 20 to 80% in the different experiments. Pseudomonas and Thiobacillus species were responsible for the aerobic degradation of malodorous sulfur compounds.

43614 **APTIC NO. 66650**

Kronsbein, D. G.

PURITY ACCORDING TO NEED. FILTERS CLEAN COMPRESSED AIR - HIGH DEGREE OF POLLUTION BY SMALLEST PARTICLES. *(Reinheit nach Erfordernissen. Filter reinigen Druckluft - Hoher Verschmutzungsgrad durch Kleinstteilchen). Text in German. VDI (Ver. Deut. Ingr.) Nachr. (Berlin), 28(40):28-29, 1974.*

Compressed air is used in many process equipments with different requirements for purity. The air that is drawn on very likely contains more than 140 million dust particles/cu m, 80% of which have a diameter of less than 2 micron. The pollution by hydrocarbon gases usually is also high; fractions of 0.004 micrograms/l air have been measured. Air filtering with a 5 micron filter should begin in the intake pipe of the compressor so that all larger particles are separated. The removal of oil, water, and smallest particles comes next by means of a glass fiber filter with microfine fibers. Where it is necessary, an activated coal filter for adsorption of hydrocarbons and odorous substances follows. The last stage in the filtering system is formed by a sterilizing filter for separation of germs. It consists of microfibers of boron silicate glass with diameters between 0.1 and 1 micron. They are cleaned and newly sterilized with hot steam.

43615 **APTIC NO. 66609**

Kuliyev, A. M., R. A. Bagirov, E. R. Kuliyev, T. S. Farkhadov, and E. M. Ali-Zade

CLEANING OF AND HYDROGEN SULFIDE REMOVAL FROM NATURAL GAS. *(Osuchka i ochistka prirodnogo gaza ot serovodoroda). Text in Russian. Gaz. Prom., no. 7:39-41, 1974. 5 refs.*

The adsorption of hydrogen sulfide, moisture, carbon dioxide, and higher hydrocarbons from raw natural gas on different zeolites was studied in laboratory and pilot tests. The zeolites NaX, MgA, and CaA were found to have the greatest adsorption capacity for H2S under laboratory conditions. Selective adsorption of H2S, moisture, and CO2 by zeolites under 56-60 kp/sq cm pressure was noted. Under these conditions, a temperature of 10-22 C, and at flow rates of 0.2-0.3 m/sec, the adsorption efficiency reached 98%, and the residual H2S content in the purified natural gas amounted to 2-5 mg/cu m. The adsorption capacity of the zeolites was considerably higher for H2S alone than for its mixture with moisture, CO2 and higher hydrocarbons. Desorption at a rate of 98% was achieved at a temperature of 330-350 C and 58-60 kp/sq cm pressure in 90-100 min.

43616 **APTIC NO. 66617**

Laczko, M. and G. Szekely

CATALYTIC INCINERATION OF SOLVENTS. *(Ueber die katalytische Loesungsmittelverbrennung). Text in German. Draht-Welt, 60(7):265-268, July 1974. 1 ref.*

The kinetics of the catalytic incineration of solvents from the wire enameling process, and the utilization of the heat thus generated in the enameled wire drying oven were studied. The kinetic studies revealed that there are no hazards of accumulation of the solvents to explosive concentration in the catalytic reactor, and that the efficiency of the catalytic solvent vapor incineration is fairly high even when the efficiency of the reactor is relatively low. The wire drying process can be made autothermal by the utilization of the heat generated by the catalytic incineration of the solvents at low temperature and air-excess coefficient by minimizing the circulating air volume.

43617 **APTIC NO. 67218**

Lamb, Norman C.

NOVEL ODOR CONTROL METHOD. *(Stauffer Chemical Co., Westport, Conn.) U. S. Pat. 3,798,877. 14p., March 26, 1974. 6 refs. (Appl. Dec. 21, 1972, 26 claims).*

A method for reducing odors resulting from the manufacturing and preparing of sulfur-containing pesticidal and herbicidal compositions is described. The effluent stream of exhaust gases associated with the manufacturing and handling of the compositions are passed through a zone into which finely divided activated carbon is introduced so as to make contact with the exhaust gases and become entrained therein prior to venting to the atmosphere. The system is particularly useful for controlling odors which accompany the preparation of synthetic organic pesticide and herbicide compositions containing phosphorothiate, phosphorodithioate, and thiolcarbamate compositions. (Author abstract modified)

43618 **APTIC NO. 67209**

Lappin, Frank S., Thomas F. Lappin, and Robert W. Lappin

ANTI-AIR POLLUTION DEVICE. *(Assignee not given.) U. S. Pat. 3,800,513. 5p., April 2, 1974. 15 refs. (Appl. Feb. 14, 1973, 4 claims).*

An air flow and water washing apparatus for purifying particulate-laden air or gas streams is described which is relatively compact and provides sufficient separation for reclaiming chemicals or other materials carried within polluted air for reuse. High velocity flow is produced along a spiral path defined by auger flights, with plural water washing curtains being provided between adjacent auger flights. The polluted air is forced to pass through the successive water washing stages, while the air is caused to undergo highly turbulent flow for promoting thorough mixing of the water with the contaminated air. The apparatus is easily adaptable for conditions requiring several washing cycles.

43619 **APTIC NO. 67222**

Lindl, Gordon J.

PARTICULATE ARRESTING MEANS FOR CYCLONIC SEPARATOR. *(Arnold Dryer Co., Milwaukee, Wis.) U. S. Pat. 3,800,429. 5p., April 2, 1974. 5 refs. (Appl. Oct. 10, 1972, 1 claim).*

A particulate arresting means for removing light particulate material from the exhaust of cyclonic separators is described. The invention involves providing a sleeve which surrounds the exhaust conduit of a cyclonic separator and forms a surrounding space around the lower end of the conduit. The surrounding space is large enough to admit a swirling ring of gas containing suspended particulate material. An opening is formed in the sleeve for tangentially skimming gas and particulate material from the annular space, and a damper is adjustably mounted in the annular space adjacent the opening for controlling the flow of gas and particulate material therethrough. The damper can be adjusted to return an amount of air which meets the requirements of the dryer when the device is used to recycle exhaust gases to a dryer furnace. (Author abstract modified)

43620 **APTIC NO. 67224**

Lindl, Gordon J.

DEHYDRATING SYSTEM WITH EXHAUST GAS RECYCLING. *(The Heil Co., Milwaukee, Wis.) U. S. Pat. 3,801,264. 7p., April 2, 1974. 3 refs. Appl. April 24, 1972, 5 claims).*

A dehydrator with exhaust gas recirculation, applicable for reducing particulate and gaseous air pollutants, including odors, from drying operations involving foodstuffs, animal wastes, and forest products, is described in which the recycled exhaust gases are returned upstream of the burner in contrast to prior art methods of returning the exhaust to the downstream side of the burner. The process results in more complete incineration of the particulate matter and gaseous pollutants without adversely affecting the combustion of fuel by the burner. A fan coupled to the outlet end of a dryer is used to draw the moist product and hot gases from the furnace through the dryer, while a centrifugal cyclonic collector is coupled to the outlet of the fan. A significant portion of the exhaust gases from the collector is recycled to a hood which covers the burner and air openings at an end of the furnace. (Author abstract modified)

43621 **APTIC NO. 67246**

Lowrance, Edgar G. and John P. Eames

REMOVAL OF ACIDIC GASES FROM HYDROCARBON STREAMS. *(Stone and Webster Engineering Corp., Boston, Mass.) U. S. Pat. 3,801,698. 6p., April 2, 1974. 4 refs. (Appl. Jan. 18, 1971, 22 claims).*

A process for the removal of acidic gases from hydrocarbon streams is described which, unlike prior art processes, achieves substantially complete removal of hydrogen sulfide and/or carbon dioxide from the gas with conversion of the H_2S to useful sulfur and with the efficient and economic regeneration of reagent materials for recycling purposes. The process involves: passing the gas through an aqueous alkali metal hydroxide solution; removing any separated hydrocarbons which result upon settling; reacting the aqueous effluent liquid with an acidic reagent; solvent washing the effluent; stripping the acidic gases therefrom; and subjecting the resulting aqueous sodium sulfate solution to an electrolytic process. The apparatus used to carry out the process includes an acidic gas absorbing unit and an electrolytic cell for conversion of the soluble alkali metal salts into the corresponding alkali metal hydroxide and acidic reagents. (Author abstract modified)

43622 **APTIC NO. 67223**

Lundberg, Robert D.

SULFUR DIOXIDE REMOVAL VIA POLYMER FORMATION. *(Esso Research and Engineering Co.) U. S. Pat. 3,803,291. 5p., April 9, 1974. 1 ref. (Appl. April 4, 1972, 5 claims).*

A process for sulfur dioxide removal from waste gas streams is described which utilizes the reaction of SO_2 with a monomer capable of copolymerization with SO_2. The gas mixture is contacted with a derivative of norbornene at a temperature of about 0-100 C. The resulting polymer can be thermally decomposed at temperatures above about 150 C, thereby making repeated cyclic desulfurization and regeneration possible. The norbornene derivatives which are useful for selectively removing SO_2 according to the above process include substituted norbornenes and substituted norbornadiene compounds. Monosubstituted norbornenes constitute a preferred class of compounds. The molecular weight of the norbornene derivatives used should not exceed 1000 times the number of norbornene groups in a molecular. (Author abstract modified)

43623 **APTIC NO. 66640**

Maeda, Isamu and Hiromi Tanaka

FLUE GAS DESULFURIZATION SYSTEM. *(Haigasu datsuryu sochi). Text in Japanese. (Sumitomo Heavy Industries, Tokyo (Japan)) Japan. Pat. Sho 49-31627. 2p., Aug. 23, 1974. 1 ref. (Appl. Sept. 17, 1970, 1 claim).*

This system recovers sulfur dioxide as dilute sulfuric acid from the activated charcoal which was used in the desulfurization process. The exhaust gas is passed through activated charcoal and expelled into the air. A conveyor carries the activated charcoal containing sulfur oxides from the absorption vessel through a series of washes, and a dryer, back to the absorption vessel. The washing-flushing system consists of a series of nozzles lined up along the course of the charcoal conveyor, and operated in order in a direction opposite to the motion of the charcoal. Clean water is used in the first series of flushing, at the point closest to the charcoal dryer. Waste water from the first operation is used in the second series of flushing, and so on, until the waste water is collected in a storage tank as dilute sulfuric acid after the final series of flushing, which occurs at the point on the conveyor nearest to the emergence of the activated charcoal containing SO_2 from the absorption vessel.

43624 **APTIC NO. 67215**

Mark, Jay A.

APPARATUS FOR REMOVING NITROGEN OXIDES FROM ENGINE EXHAUST. *(Assignee not given.) U. S. Pat. 3,801,696. 3p., April 2, 1974. 4 refs. (Appl. Nov. 18, 1971, 2 claims).*

A method for removing nitrogen oxides from combustion engine exhausts is described which precludes prior art disadvantages of repair and maintenance requirements, complexity of design, and engine performance diminution. Exhaust gases are transferred into a container of saturated urea solution via a gas distribution means. Oxides of nitrogen in the exhaust gas react with the urea, resulting in the production of water vapor, carbon dioxide, and nitrogen. The product gases are then passed through a condenser which recovers water for replacement into the liquid-filled container. Following condensation, the gases are vented to the atmosphere. The speed of reaction within the container can be increased by means of a catalyst, with the preferred catalytic material being copper. (Author summary modified)

43625 **APTIC NO. 66663**

Masuda, Senichi

A NEW TREND IN ELECTROSTATIC PRECIPITATORS. *(Denki shujin gi jutsu no atarashii doko). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 1-10, 1974. 29 refs. (Presented at the Symposium on Practical Problems in Factory Dust Collection Systems, Tokyo, Japan, July 5, 1974.)*

Charging particles by ionic collision has received considerable study; it has been demonstrated that for particles larger than 2 micron, the saturated total charge is proportional to the square of particle diameter and electric field E, which is responsible for the ionic collision. The saturated total charge becomes independent of E and is proportional to particle diameter when the diameter is smaller than 2 micron, in which the collision is due to thermal agitation. The limit of dust concentration of the exhaust gas after treatment with a dry-type precipitator is 0.1-0.05 g/N cu m at the present time. The dry type has the advantage of low pressure loss and therefore, low fan operation cost. It can be used for high temperatures, high pressures, and high corrosion gases. Large spacing is used to separate the discharge electrode and dust collecting electrode. A new type of precipitator was developed by combining a dry precipitator and a wet precipitator. The hybrid precipitator solves the problems encountered by the two individual precipitators, namely, the re-dispersion of particle and inverse ionization in the dry type, and slurry treatment, low temperature, and the requirement of a large quantity of water in the wet type. New techniques such as the bias control pulse charging method, the insulation film countercurrent charging method, the charged moisture method, and noncontact collection by repulsion are being studied.

43626 **APTIC NO. 66823**

McKenna, John D.

APPLYING FABRIC FILTRATION TO COAL FIRED INDUSTRIAL BOILERS (A PRELIMINARY PILOT SCALE INVESTIGATION) (FINAL REPORT). *Enviro-Systems and Research, Inc., Roanoke, Va., Environmental Protection Agency Contract 68-02-1093, Program Element 1ABO12, EPA-065/2-74-058, ROAP 21ADJ-038, 89p., July 1974. 5 refs.*

The techno-economic feasibility of applying a fabric filter dust collector to coal-fired industrial boilers was investigated on a pilot scale. Overall efficiencies greater than 99.5% were achieved with Nomex felt at an air to cloth (A/C) ratio of six to one. Cleaning improved with increasing volumes of reverse air. Both woven Teflon and Gore-Tex on Nomex backing had better release properties than Nomex felt. Installed costs for filter media and electrostatic precipitation at three levels of efficiency are included. Based on 25% bag replacement per yr and an electrostatic precipitator efficiency level of 98%, Nomex felt and Gore-Tex on Nomex backing are competitive with an electrostatic precipitator at A/C greater than 4/1. Teflon felt needs and A/C greater than 7/1 before it becomes competitive. (Author abstract modified)

43627 **APTIC NO. 66737**

Miller, K. J. and A. F. Baker

EVALUATION OF A NOVEL ELECTROPHORETIC SEPARATION METHOD TO REMOVE PYRITIC SULFUR FROM COAL. *Bureau of Mines Report of Investigations 7960, 17p., 1974. 1 ref.*

Electrophoretic mobility measurements of coal and pyrite particles in distilled water revealed a difference between the migration speeds of the two materials toward the anode in a direct current electric field and led to the development of a laboratory electrophoresis column for separating pyritic sulfur from coal by utilizing the electrokinetic and specific gravity differences between coal and pyrite. Pyrite and other impurities were demonstrated on a laboratory scale to be separable from fine coal by electrophoresis using a stage separation technique. Electrical power for electrophoresis was extrapolated to about $1/ton of clean coal product in a cost analysis. Since the only successful tests ever made were in the laboratory with prewashed samples of minus 100- plus 325-mesh coal in distilled water, the cost figure derived was not representative of conditions prevalent in commercial coal cleaning operations; true conditions would reflect costs many times as great. Although the process and apparatus were deemed impractical for commercial coal preparation, the electrophoresis column may have some application as a laboratory device. (Author abstract modified)

43628 **APTIC NO. 66866**

Miyoshi, Ichiji

DEODORIZATION SYSTEM FOR DOMESTIC SEPTIC TANK. *(Kateiyo jokaso no dasshu sochi). Text in Japanese. (Miyoshi Co., Ltd., Yokohama (Japan)) Japan. Pat. Sho 49-21833. 2p., June 11, 1974. (Appl. Feb. 10, 1970, 1 claim).*

A home septic tank is divided into putrefication tank and purification tank by a wall. The domestic sewage is led into the putrefication tank by a pipe. The bad odor gas rises to the space above, and is drawn by a suction pipe. The blower forces the odor gas into the purification tank in which activated sludge is constantly multiplying. The pipe extends to the bottom, where it is connected with a horizontal dispersion pipe with numerous dispersion holes. The bad odor gas is forced to mingle with the activated sludge, and the gas rising to the top is odorless. The blower helps to disperse gas rising above the sludge.

43629 **APTIC NO. 66625**

Morishita, Teizo

THE NEW VENTILATION BAND DRYING METHOD-ACTIVATED SLUDGE AND FERTILIZATION TECHNIQUE. *(Atarashii tsuki bando kanshoho- kassei surajji no hiryoka gijutsu). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):10-11, Aug. 1974.*

A ventilation band dryer is suitable for drying activated sludge for use as organic fertilizer. Activated sludges were put through a molding machine where they were cut into small pieces at a given temperature and pressure. The pieces were then loaded on metal conveyor which carried them through a basket conveyor to a hopper. Hot air was introduced from top and through the first conveyor. The slightly damp hot air from the first conveyor then passed through the second conveyor where sludge supplied from the first conveyor containing less moisture was again dried. The resulting air was led to a cyclone scrubber where it was washed with water. Dust removal as well as odor removal where thus accomplished. Analytical data showed that the exhaust gas after treatment contained 5.1 ppm ammonia, 3.48 hydrogen sulfide, 0.047 ppm methyl mercaptan, 0.021 ppm methyl sulfide, 0.59 ppm trimethylamine, and 0.00054 g/N cu m dust, reduced from 8700 ppm, 348.4 ppm, 17.4 ppm, 348.4 ppm, 122 ppm, and unknown concentrations respectively.

43630 **APTIC NO. 67217**

Morris, George O.

RECOVERY OF HYDROGEN FLUORIDE. *(Imperial Chemical Industries, Ltd., London (England)) U. S. Pat. 3,798,875. 4p., March 26, 1974. 2 refs. (Appl. Feb. 22, 1972, 16 claims).*

A process for the recovery of hydrogen fluoride from gaseous mixtures is presented which overcomes prior art problems associated with heat transfer and breakdown of solid absorbents by using the absorbing solid in an inert liquid. The gaseous mixture is passed through a suspension of an alkali-metal fluoride, preferably sodium fluoride, in an inert liquid having a boiling point of at least 250 C. The suspension is maintained at a temperature below 180 C and at a temperature at which the hydrogen fluoride is absorbed by the suspension. The suspension is heated to a temperature of greater than 180 C for liberation of the hydrogen fluoride, with the suspension then being regenerated. The process may be applied to the recovery of hydrogen fluoride from mixtures in which the hydrogen fluoride content varies as much as from 2-98% by weight.

43631 **APTIC NO. 66672**

Nagaoka, Masaharu

NOX CONTROL MEASURES FOR THERMAL POWER BOILERS. *(Karyoku hatsuden boiler no NOx taisaku ni tsuite). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), p. 11-14, 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 28-29, 1974.)*

The control of nitrogen oxide emission by improvement of combustion facilities and the future development of stack gas denitrification are briefly discussed. The two-step method of combustion is very effective when applied to 300-400 ppm of initial NOx concentration, and it it often applied to coal boilers. Though effective for both fuel and thermal NOx concentration attenuation, this method often produces a large amount of soot, compared to a mixture of flue gas for combustion. A variation of tht two-step combustion is extinguishing of the upper burner and supplying air through it. In actual cases, a 20-40% NOx reduction has been achieved by this method. The flue gas mixture combustion is ineffective for attenuation of fuel NOx; but for boilers using low-nitrogen fuels, the method is particularly effective, achieving as much result as a 60% attenuation. This method if effective in combination with converting the fuel to a low-nitrogen fuel, though the use of low nitrogen fuels does not not necessarily result in reduction of NOx emission, depending on the type of boiler. The amount of flue gas mixture is about 15% ordinarily, and up to 30% for new boilers. The decrease of NOx emission is proportionate with the amount of mixed gas in the beginning. With higher nitrogen fuels, a saturation point is reached rather soon.

43632 **APTIC NO. 67248**

Nelson, Gerald V. and Glenn C. Wray

DESULFURIZATION PROCESS. *(Texaco Inc., New York) U. S. Pat. 3,804,748. 2p., April 16, 1974. 7 refs. (Appl. May 7, 1971, 7 claims).*

Fuel oils of reduced sulfur content are prepared by separating a residue-containing petroleum fraction into a vacuum gas oil and a vacuum residuum. The vacuum gas oil is catalytically hydrodesulfurized in the presence of a catalyst comprising a hydrogenating component on a support, the catalyst having a surface area of at least 250 sq m/g, a pore volume of at least 0.6 cc/g, and containing at least 2 wt% silica. The desulfurized vacuum gas oil is then combined with the vacuum residuum. This novel process solves the problems of collection of polynuclear condensed ring aromatic compounds on the catalyst and decomposition of the polynuclear condensed ring aromatic compounds with the formation of a coke deposit which can cause deactivation of the catalyst. (Author abstract modified)

43633 **APTIC NO. 66598**

Neri, Franco

REMOVAL OF ORGANIC SOLVENTS FROM INDUSTRIAL WASTE GASES. *(L eliminazione dei solventi organici dagli scharichi industriali gassosi). Text in Italian. Ing. Mecc., 13(700):17-23, March 1974.*

Technical and economic aspects of flue gas incinerators for the elimination of organic solvent vapors in metal lacquering operations, especially in the automobile industry, are described. Such flue gases contain 1000 to 3000 ppm organic vapors, as well as carbon monoxide, and various malodorous substances. The temperatures required for the thermal incineration of the hydrocarbons, for the oxidation of CO, and for odor control are 500-650 C, 650-750 C, and 500-820 C, respectively. It is possible to reduce the hydrocarbon, CO and malodorous substance concentrations by 90 to 98% in modern incinerators at temperatures of 750 C and over. Heat recovery, either direct or indirect, reduces the operating costs of thermal incinerators substantially.

43634 **APTIC NO. 67254**

Nicklin, Thomas

TREATMENT OF GASES. *(The Gas Council, London (England)) U. S. Pat. 3,798,315. 3p., March 19, 1974. 4 refs. (Appl. Oct. 26, 1971, 2 claims).*

A process for the production of sulfur from a gaseous mixture containing hydrogen sulfide and sulfur dioxide is described which precludes the emission of effluent gases associated with the conventional Claus Kiln process for sulfur recovery. The process consists of contacting the gaseous mixture in a reactor vessel with a catalyst consisting of oxides of nickel and uranium on a carrier such that H2S and SO2 are reacted together to yield S. The catalyst composition is comprised of 1-20% nickel oxide and 2-15% uranium oxide, based on the weight of the metals in relation to the total weight of the catalyst. A preferred aspect of the invention involves producing some or all of the H2S by the reaction of carbon disulfide and/or carbon oxysulfide with steam in the presence of the catalyst, with the removal of the COS and/or CS2 occurring in the same reactor as used for the reaction of H2S with SO2.

43635 **APTIC NO. 66597**

Noyon, J.

COLLECTION AND DEDUSTING OF FLUE GASES FROM A 100-110 TON CAPACITY, OXYGEN-BLOWN ELECTRIC-ARC FURNACE. *(Captage et depoussierage des fumees sur four a arc de 100-110 tonnes a soufflage d oxygene). Text in French. Tech. Moderne, no. 6:53-54, June 1974.*

The flue gas collection and flue gas dedusting system designed for a new oxygen-blown electric-arc furnace with 100-110 ton capacity in a steel mill is described. The flue gas containing submicron iron oxide particles is exhausted from the furnace space in such a manner that the vacuum is maintained. The flue gas to be dedusted is saturated with water vapor, and enters a venturi scrubber which provides for high particle speeds and intimate contact between the oxide particles and water droplets.

43636 **APTIC NO. 66602**

Ochs, H.-J.

ELECTROSTATIC AIR FILTER OIL MIST SEPARATION. *(Elektro- Luftfilter zur Oelnebelabscheidung). Text in German. Metallwirtsch. Metallmarkt., 28(8):767-771, Aug. 1974. 5 refs.*

The design and operation of electrostatic air filters for the separation of oil mist from the air in machine shops using oils and oil emulsions as cooling agent for cutting tools are described. The electrostatic air filters according to the Penney system are composed of an entry zone in which the oil particles entrained are ionized by corona discharge at a negligible rate of ozone formation, after which the charged particles are separated in a second zone between plates. The separation efficiency, amounting usually to a least 90%, increases with decreasing air flow rate, and decreases with increasing nonuniformity of the flow over the cross-section. Soiled oil mist usually requires a preliminary mechanical stage for the separation of coarse particles.

43637 **APTIC NO. 66901**

Ogawa, Tomon

THE JAPANESE VERSION OF THE MUSKIE LAW AND ENVIRONMENTAL POLLUTION: DIESELS AND THE TROUBLESOME HIGH COMPRESSION RATIO. *(Nihonban masuki-ho to kankyo osen: takai asshukuhi ga yakkai na jizeru). Text in Japanese. Jidosha to Seibi (Automob. Maint.), 28(9):44-48, Sept. 1974.*

The number of diesel vehicles in Tokyo, including automobiles, buses, and trucks, is about 100,000 and those in the entire country are 2.5 million. Nitrogen oxides emitted by these vehicles comprises 10% of that emitted by all vehicles, or 6500 tons. The difference between gasoline engine and diesel engine is the Otto cycle, which cannot increase the pressure ratio because of the danger of early ignition. The diesel engine cycle is inferior to the Otto cycle, but the pressure ratio can be increased to twice the ratio of a gasoline engine. When the pressure ratio is epsilon equals 20, the temperature rises to 680 C and the pressure temperature is close to 1000 C. Consequently, the NOx emission is extremely high. Two cars each of direct injection, pre-combustion, and whirlpool type were tested on a highway in Tokyo. With the increase of the crank angle delay, the ratio of NOx decrease increased. There was little increase in the overall fuel consumption, except for one whirlpool car with a maximum 8% increase. For some cars, the fuel consumption even decreased. Black smoke increased for some and decreased for some. The maximum power output decreased by 15% limit for only one whirlpool with a delay of seven degrees. The adjustment of fuel injection delay for a diesel engine car will cost about $10.

43638 **APTIC NO. 67200**

Ohle, Harold F.

POLLUTION CONTROL APPARATUS. *(Assignee not given.) U. S. Pat. 3,802,158. 6p., April 9, 1974. 10 refs. (Appl. June 22, 1973, 7 claims).*

A pollution control apparatus, combining both a water wash and an electrostatic precipitator, is designed for the removal of grease, smoke, and other particulate air pollutants from exhaust air discharged by restaurants. Water spray nozzles wash grease and large particles from the exhaust, with the separated material falling into a collection tank having a skim dam at one end and spray nozzles at the other end. The water spray skims the grease off the water so that the water can be circulated. Baffles disposed across the path of the washed air remove most of the water, while a downstream filter system removes most of the remaining moisture. The generally non-turbulent air leaving the filter is slowed in a stall chamber, and electrostatic precipitators next act on the air as it leaves the stall chamber to remove smaller particle pollutants not removed by the water wash section. (Author abstract modified)

43639 **APTIC NO. 67242**

Parsons, Charles F., Jr.

DUST FILTER. *(Assignee not given.) U. S. Pat. 3,803,814. 6p., April 16, 1974. 9 refs. (Appl. Feb. 28, 1972, 6 claims).*

An air filter for removing particulate matter from air is designed to provide continuous onstream operation while maintaining the filter media sufficiently clean to insure efficient operation. The apparatus consists of a filter module having two banks of filter elements connected between an inlet conduit and an outlet conduit. A second outlet conduit is maintained below atmospheric pressure and is periodically and alternately connected to the upstream sides of each bank of filter elements simultaneously with the disconnection of the respective bank from the inlet duct. The second outlet duct which thus carries the previously collected particulate matter from the filter is connected to the inlet of a final filter such as a conventional dust collector from which the particles are removed in solid cake form. A system which is more efficient in operation and more economical to manufacture and maintain is obtained by stacking several of the relatively inexpensive filter modules together, all feeding a common final filter. (Author summary modified)

43640 **APTIC NO. 67228**

Pausch, Josef

FILTER CLEANING APPARATUS. *(General Resource Corp., Hopkins, Minn.) U. S. Pat. 3,798,878. 5p., March 26, 1974. 4 refs. (Appl. Aug. 18, 1972, 8 claims).*

An improvement in backwash cleaning of filters is described which provides an increased backwash pressure without the necessity of increasing the pressure of the gas reservoir source which is used with the backwash apparatus. The improvement consists of a blow tube connected to the compressed gas reservoir and aligned above the dust filter bag and a bowl-shaped receptacle positioned beneath the orifice at a distance determined by projecting a 28 degree spherical angle from the orifice downwardly. The distance is sufficient to allow the projection of the spherical angle to intersect within the interior surface of the bowl-shaped receptacle. The throat diameter of the bowl-shaped receptacle between 5-10 times that of the orifice diameter. A perforated cover plate is used to connect the bowl-shaped receptacle to the dust filter bag interior.

43641 **APTIC NO. 66900**

Pick, Peter E.

SOLID ADSORBENTS FOR GAS AND LIQUID TREATMENT. *PACE, 27(6):23-27, June 1974.*

The use of silica gel and molecular sieves as solid adsorbents is reviewed in relation to the purification, separation, and dehydration of gases and liquids. The selectivity of silica gel for organic molecule adsorption depends on the molecules polarizability, degree of unsaturation, and volatility. Silica gel is used to dehydrate air, carbon dioxide, natural gas, alcohol mixtures, and aromatics, as well as for chromatographically separating organic fractions. The life of a silica gel bed depends on the number of regenerations that it undergoes, with total lives being commonly measured in years even for regeneration every 20 min. Molecular sieves are far more thorough in their adsorption action than silica gel, though they will not adsorb as much water on a weight-for-weight basis. The chemical composition of the sieve determines its pore volume and capacity, with the composition consisting basically of aluminosilicate lattices that are anionic and counterbalanced by sodium. Silica gel or molecular sieve designs can be calculated for: dehydration of air, carbon dioxide, or any other gas; water and CO2 removal from air; water and CO2 removal from liquid natural gas; removal of sulfur compounds from natural gas; hydrocarbon separation; and regeneration or cooling requirements for adsorption systems.

43642 **APTIC NO. 66963**

Plonsker, L., E. B. Rifkin, M. E. Gluckstein, and J. D. Bailie

MANGANESE STEEL ADDITIVE. *Diesel Gas Turbine Progr., 15(11): 66-68, Nov. 1974.*

The effec of methylcyclopentadienyl manganese tricarbonyl (MMT) fuel additive on smoke and particulates was determined in gas turbines at three utilities rated at 15 MW, 20 MW, and 30 MW. The tests confirmed earlier work showing that the addition of MMT to distillate fuels used in stationary power generating gas turbines significantly reduces visible smoke, total particulate, and carbon. When MMT was used at concentrations corresponding to 20 to 100 ppm manganese, Bacharach smoke, particulate, and carbon emissions are generally reduced by 50-90%. (Author conclusions modified)

43643 **APTIC NO. 66601**

Poetschke, H.

PLANT FACILITIES FOR ENVIRONMENTAL PROTECTION. *(Betriebsausruestungen fuer den Umweltschutz). Text in German. Metallwirtsch. Metallmarkt., 28(8):763-767, Aug. 1974.*

Ventilation, air conditioning, waste disposal, and noise control facilities currently manufactured for industrial use are described. Modern ventilation and air conditioning systems, designed for large air volumes, integrate exhaust, air filtration, cooling, heating, and humidifying functions. The mechanical assembly technique is widely adopted in the design of ventilation and air conditioning systems.

43644 **APTIC NO. 67212**

Raduly, Lajos, Ioan Urmosi, Nita Todereanu, and Nicolae Chiroiu

PROCESS FOR GAS DEMERCURATION. *(Grupul Industrial de Chimie, Rimnicu, Vilcea (Romania)) U. S. Pat. 3,803,803. 4p., April 16, 1974. 2 refs. (Appl. June 6, 1972, 2 claims).*

A process for the removal of mercury from gas streams is described which overcomes prior art disadvantages of time consuming adsorbent recovery operations and contamination by chlorine and hydrogen sulfide in certain gas streams. The gases to be treated are contacted with a porous material such as silica gel, active carbon, porous aluminosilicates, or metallic oxides which are impregnated with an aqueous solution of trivalent iron salt such as ferric chloride, ferric sulfate, ferric nitrate, ammonium ferric alum, potassium ferric alum, ferric hydrogen sulfate, ferric perchlorate, or ferric acetate. The contact is performed at temperatures ranging from 0-100 C and at any pressure. Excess water is run off, and the impregnated mass may be dried superficially before utilization.

43645 **APTIC NO. 66664**

Reboux, Alain

SURVEY OVER THE FORMATION AND CONTROL OF NITROGEN OXIDES EMITTED BY COMBUSTION EQUIPMENT. *(Synthese sur la formation et le controle des oxydes d azote emis par les installations de combustion). Text in French. Pollut. Atmos. (Paris), 16(62):191-199, April-June 1974. 34 refs.*

The mechanisms of the formation and methods for the abatement of nitric oxide and nitrogen dioxide in combustion equipment are reviewed. The NO formation from the combustion air nitrogen takes place principally in the flame front due to the presence of oxygen, hydroxide, carbon, hydrocarbon, and cyanide radicals. The NO formation in the combustion products is due to a chain mechanism in the presence of N2, N, O2, O, and NO radicals as described by the Zeldovich model. The NO formation from the nitrogen contained in the fuel is independent of the above mechanisms and of the nature of the nitrogen-containing compound in the fuel. Unlike in the above mechanisms, the combustion temperature plays but a subordinated role, while the rate of NO formation increases with the increase in the air-excess coefficient. The proportion of NO formed from atmospheric nitrogen is reduced by a high air-excess coefficient due to temperature reduction. The NO formation from the fuel nitrogen is strongly dependent on the availability of oxygen. The share of NO formed from fuel nitrogen may reach 80% for a fuel with 0.2% nitrogen. The rate of NO formation can be reduced by abandoning air preheating, water or water vapor injection into the combustion chamber, reduction of the air excess coefficient, and by the use of two-stage combustion chamber or swirl type burners. Once formed, NO and NO2 can be eliminated from the flue gases by absorption or adsorption by silica gel, alumina, manganese hydroxide, alkaline or organic solutions, by means of lime in wet type dust separators, or by catalytic reduction.

43646 **APTIC NO. 66592**

Reither, K.

CLEAN AIR MAINTENANCE IN THE METALWORKING INDUSTRY. *(Luftreinhaltung in der metallverarbeitenden Industrie). Text in German. Galvanotechnik, 65(7):628-630, 1974.*

The principle and uses in the metalworking industry of KT model gas scrubbers are described. The gas scrubbers, of vertical or horizontal cylindrical design, have spray nozzles parallel with and opposite to the waste gas flow. They are available for throughputs of 36,000 and 280,000 cu m/hr. Higher capacity can be achieved by parallel connection of several units. The scrubbers are characterized by small pressure losses comprised between 15 and 70 mm water column for single-stage, and between 30 and 40 mm water column for two-stage designs. The hydrochloric acid-containing waste gases from a continuous wire pickling unit are scrubbed with water, and the dilute hydrochloric acid solution obtained in recycled within the pickling process. In two-stage operation, the HCl concentration is reduced from 3000 mg/cu m to 0.5 mg/cu m. In an electroplating shop, the vent air loaded with droplets and vapors of chromic acid from a chromium-plating bath is treated with KT model scrubbers, and the chromic acid recovered is recycled within the process. The chromic acid concentration in the air is reduced from 0.21 mg/cu m to 0.003 mg/cu m. The hydrofluoric acid-containing air in an eloxadizing shop is purified by KT scrubbers, using dilute sodium hydroxide solution as absorbent. Water is used for absorption of cyanides from the air in a hardening shop.

43647 **APTIC NO. 67252**

Reither, Karl

WET SCRUBBER FOR AIR PURIFYING SYSTEMS. *(Kunststoffetechnik G.m.b.H. and Co., KG, Troisdorf (West Germany)) U. S. Pat. 3,795,089. 12p., March 5, 1974. 10 refs. (Appl. Jan. 21, 1972, 36 claims).*

A wet scrubber for purification of gas streams is described which provides thorough wetting of the incoming contaminant laden gas and which allows for facile installation and removal of various components. The device consists of a cylindrical housing with an inlet and outlet, a wetting means, and one or more liquid discharge openings in the housing for conducting the liquid purging agent from the housing. The wetting means consists of several jet banks spaced from each other along the longitudinal axis of the housing. The jet banks are mounted in such a manner that they may be installed and removed transversely of the longitudinal axis of the housing. Several packings are positioned in the housing and are spaced from each other along the housing s length. Each packing is located between an adjacent pair of jet banks and can be removed and installed in a longitudinal direction with respect to the housing when somy of the jet banks are removed.

43648 **APTIC NO. 66638**

Saeki, Motohisa, Yoshinori Hosono, and Itsuo Yamamoto

DEODORIZER. *(Dasshuzai). Text in Japanese. (Japan Heavy Chemical Industries, Tokyo (Japan)) Japan. Pat. Sho 49-27511. 2p., July 18, 1974. (Appl. March 20, 1970, 1 claim).*

A deodorizer was manufactured, as a double salt of iron and managanese with nitrohumin fuming nitric acid. Nitric acid was reacted with peat, turf. and brown coal, to form fuming nitric acid. Twenty-five parts of a manganese-iron ore containing 75% manganese dioxide iron oxide were mixed with 100 parts of this acid. Water was added, and the mixture was allowed to react at 135 C. The double salt of the acid with manganese and iron formed readily. When dried, this became the principal component of the deodorizer. The deodorizer is effective in removing cationic as well as anionic sources of odor. This double salt alone, or in combination with other deodorizers (activated charcoal, iron hydroxide, calcium carbonate), removes ammonia and hydrogen sulfide gases to a greater degree than the acid itself, the manganese salt of the acid, the iron salt of the acid, or two of the commercial deodorizers.

43649 **APTIC NO. 66662**

Saito, Takeshi

COMPOSITION OF EXHAUST GAS FROM SPARK IGNITION ENGINE USING METHANOL FUEL. *(Metanoru nenryo ni yoru hibana tenka kikan no haiki sosei). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Osaka, p. 95-98, 1974. 3 refs. (Presented at the Japan Society of Mechanical Engineers, National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1417.)*

The composition of exhaust gas from a spark ignition engine using methanol fuel was studied. The experimental engine was a CFR engine (F-2). The compression ratio was 6.0; ignition time was 22 BTDC; and the rate of revolution was 900 rpm. The fuels compared were gasoline, methanol, and a methanol-water mixture. The carbon monoxide concentration in the exhaust gas remained essentially unchanged for all three fuels. The nitric oxide concentration decreased when methanol rather than gasoline was used, and decreased even further when methanol-water was used. More organic components were produced for use of methanol than from gasoline usage. The same type of after-treatment that is used for the hydrocarbon residue from gasoline must be applied. The hydrocarbon residue from methanol usage was high in methane, so the photochemical reactivity was low. Aldehyde concentrations increased, mostly as formaldehyde.

43650 **APTIC NO. 67237**

Sato, Atsushi

AIR CLEANING AND AIR CONDITIONING. *(Kuki chowa ni okeru ea kuriningu ni tsuite). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), 25(6):29-35, June 1974. 1 ref.*

The EAC (Electronic Air Cleaner) is discussed with some mention of other cleaning methods such as a wet filter, absolute filter, self-load filter, and electrified material filter. The EAC refers usually to the two-step electrostatic cleaner installed inside an air-conditioning unit, and it has a high microparticle collection efficiency. All EACs comprise three sections: the control system, the power source system supplying high voltage electricity, and the part that adsorbs dust particles. As the dusts enter the unit, the ionization unit charges the particles with electricity with its strong electric field. The dust collection section has a positive electrode plate and the earth plate. The positive electrode pushes the + particles to the earth plate, and the earth plate simultaneously attracts the dusts and collects them. Using an NBS dust pot, the efficiency is 60 to 99.9%. The collection efficiency can be measured by the weight method, the dust pot method (colorimetry), and the coefficient method. An EAC can contain the heating and cooling unit, or the return dust unit, or the return grill. For maintenance, in a normal home environment, the cell should be washed once a month, and once three to six months in enclosed environment such as an office environment. In heavily polluted environment such as restaurants and tearooms, the cell should be washed twice a month. The EAC utilizes voltages as high as 10,000 V, but the structure is designed so that the high pressure part will be out of reach and various safety devices protect operators from any type of injury.

43651 **APTIC NO. 67207**

Scheitlin, George E. and Richard F. Little

CATALYTIC CONVERTER. *(Arvin Industries, Inc., Columbus, Ind.) U. S. Pat. 3,801,287. 7p., April 2, 1974. 11 refs. (Appl. Nov. 16, 1972, 4 claims).*

A catalytic converter for reducing automotive exhaust emissions is described in which a tilted conversion chamber is mounted to permit expansion and contraction without warping and without loss of catalytic material. The conversion chamber is mounted in an elongated outer shell with inlet and outlet openings at opposite ends and extends diagonally across the converter. The chamber is provided with a pair of opposed faces having openings for gas passage therethrough. One end of the conversion chamber is fixed to the converter, while the opposite end is slidably connected such that the chamber is free to expand and contract in response to temperature changes. (Author abstract modified)

43652 **APTIC NO. 67253**

Scheitlin, George E., Joseph B. Collins, and Michael W. Lambert

CATALYTIC CONVERTER. *(Arvin Industries, Inc., Columbus, Ind.) U. S. Pat. 3,799,748. 6p., March 26, 1974. 13 refs. (Appl. Dec. 1, 1972, 4 claims).*

A catalytic converter for removing noxious pollutants from an engine exhaust gas stream is described which permits expansion and contraction of the conversion chambers without their warping and which ensures a maximum exposure of the exhaust gases moving through the converter to the catalytic material. The device consists of an elongated outer shell closed at its ends by a pair of caps, with an inlet conduit projecting through one of the caps and an outlet conduit projecting through the other cap. The inlet and outlet conduits are in open communication with the interior of the converter. A pair of conversion chambers adapted to hold the catalytic material are mounted in the shell between the inlet and outlet conduits. The chambers, which ary provided with a pair of opposed perforated walls for passage of the exhaust gases therethrough, are rigidly connected to the outer shell at their opposed ends. The adjacent ends of the chambers are slidably interconnected to permit the chambers to expand and contract with respect to each other and with respect to the outer shell. (Author summary modified)

43653 **APTIC NO. 67213**

Schischkow, Konstantin F.

EXHAUST PURIFIER AND METHOD. *(Assignee not given.) U. S. Pat. 3,800,532. 4p., April 2, 1974. 4 refs. (Appl. Feb. 8, 1973, 11 claims).*

A highly simplified catalytic exhaust purifier for reducing internal combustion engine emissions is described. A container is secured directly to the outside of the engine in such a manner that vibration of the engine will shake the container. A quantity of catalytic material in the form of discrete particles is placed within the container, and a tube is led from the interior of the container into the engine exhaust manifold at the region of maximum temperature. The vibration of the container causes the catalytic material to form a fine dust which is pulled into the exhaust manifold through the tube by the pulsing pressures set up in the exhaust manifold by operation of the engine. (Author summary modified)

43654 **APTIC NO. 66699**

Schwochow, Friedrich

SORPTION MASSES BASED ON CLAY AND SILICIC ACID. *(Sorptionsmassen auf Basis Tonerde und Kieselsaure). Text in German. Chem.-Ing.- Tech., 46(18):753-756, 1974. 9 refs.*

A comparison of the absorption properties of silicic acid and clay with those of zeolite molecular sieves is followed by an account of the principal applications of zeolitic aluminosilicates, such as fine purification of gases, drying of coolants, resolution of isomers, oxygen enrichment, and waste gas purification. Variation of the most important property-determining parameters--silica/alumina ratio in the structure, the valence, radius, and position of the cations, particle size, vehicles, and macropore structure--permits adjustment of the factors of importance for particular applications, e.g., adsorption rate, mass transfer zone, lattice polarity, selectivity, and stability in the granular material. Since the stability of the zeolites towards acidic gases increases with the silica/alumina ratio in the structure, aluminosilicate zeolites having especially high silicic acid contents have been developed, e.g., for removing oxides of nitrogen and sulfur from exhaust gases. Production difficulties associated with increasing silica contents and decreasing lattice polarity cast doubt on the general application of such special zeolite types. Combinations of crystalline aluminosilicates with amorphous sorption masses will therefore come into increasing use in the next few years.

43655 **APTIC NO. 66660**

Seiyama, Tetsuro

CATALYTIC REACTION FOR ENVIRONMENTAL PROTECTION. *(Kankyo hozen no tame no shokubai hanno). Text in Japanese. Kagaku (Science), 29(9):670-674, Sept. 1974. 23 refs.*

The present status and future prospects of the control methods for nitrogen oxides, sulfur oxides, carbon monoxide, and hydrocarbons by various methods, particularly by catalytic reaction, are reviewed. The major catalytic oxidation reactions are CO to carbon dioxide, HC to CO2, and sulfur dioxide to sulfur trioxide. One example of catalytic reduction is the reaction of nitric oxide to nitrogen. In the complete oxidation reaction of CO and HC, the variation in catalytic activity with the type of substance to be oxidized is not evident, however, there is a correlation between the catalytic activity and heat of formation of oxidation products. Catalysts can be classified generally into high activity catalyst such as platinum, palladium, hopcalite, and cobaltic oxide, medium activity catalysts such as ferric oxide, nickel oxide, and vanadium pentoxide, and low activity catalysts such as titanium dioxide, zinc oxide, and molybdenum trioxide. The reducing agents used for catalytic reduction of NO are HC, CO, hydrogen, and ammonia, and the order of reaction activity is H2, NH3, CO, and HC. Similarly to the case of catalytic oxidation, a certain correlation is found between the activity and formation heat. The reports on the adsorption of NO onto metal or metallic oxides, reduction of NO by CO in the presence of Fe2O3, reduction of NO by H2 in the presence of metallic oxides, and reduction of NO by NH3 are reviewed. The desulfurization method for heavy oil by hydrogenation of sulfur compounds such as mercaptan and thiophene to hydrogen sulfide is also reviewed.

43656 **APTIC NO. 67172**

Soole, B. W.

THE ROTARY IMPACTION FILTER--A COMPACT, REVOLUTIONARY DEVICE OF LOW RESISTANCE FOR THE CONTINUOUS CLEANING OF HIGH SPEED GASES. *Filtration Separation (Purley), 11(5):483-487, Sept./Oct. 1974. 23 refs.*

A rotary impaction filter was designed and patented to remove gas-borne mist and dust to any desired degree, provided certain conditions are observed. The new type of filter is particularly suitable for cleaning large flows of fast moving gases. It was originally designed for filtering air in ships. The preliminary design and experiments with the filter are described. Design theory is also discussed. (Author abstract modified)

43657 **APTIC NO. 66673**

Staudinger, W.

INVESTIGATING THE CLEANING EFFECT OF GAS-FIRED POST-COMBUSTION CHAMBERS ON WASTE GAS FROM COFFEE BEAN ROASTING. *(Untersuchungen des Reiningungseffektes gasbetriebener thermischer Nachverbrennungen an abgasen von Kaffeeroestereien). Text in German. Gas Waerme Int., 23(4):121-125, April 1974. 7 refs.*

The cleaning effect of a gas-fired post-combustion chamber on the waste gas discharging from a coffee bean roasting plant was investigated. The typical odor of the gas produced in roasting is caused by hydrocarbons, aldehydes, and organic acids. A post-combustion chamber operating at about 650 C reduces the percentage of the odor producing compounds so that the waste gas is free from odor. The seventh ordinance enacted for implementing the Clean Air Act that would apply in assessing the cleaning effect of a post-combustion chamber specifies an emission of 300 mg/cu m of total carbon as the upper limit. Using a newly designed post-combustion chamber, a concentration far below the above upper limit was achieved. The concentration was kept below the upper limit of 50 mg/cu m now specified by the authorities. The gas-fired post-combustion chamber was a simple, cost-saving, and efficient waste gas cleaning unit.

43658 **APTIC NO. 67219**

Stone, Raymond E. and Robert D. Coakley

MOBILE FIELD BURNER. *(Assignee not given.) U. S. Pat. 3,802,020. 6p., April 9, 1974. 3 refs. (Appl. Dec. 27, 1972, 16 claims).*

A mobile field burner for burning loose seed grass after harvest without excessive air pollution is described. The apparatus consists of a vehicular structure having a combustion chamber and a means for collecting and conveying to the chamber loose seed grass remaining on the ground after harvest. Impingement means are provided for directing some of the hot combustion gases from the chamber into the soil as the burner traverses the field. The flue system of the combustion chamber is equipped with a group of cyclones for cleaning at least a major portion of the combustion gases before their emission into the atmosphere by separating the dirt, cinders, and other particulates from the gases and distributing the separated solids on the ground. A system for recirculating a portion of the gases through the combustion chamber is provided to promote efficiency of the system. (Author abstract modified)

43659 **APTIC NO. 66951**

Suetaka, Toru

AN OVERALL VIEW OF BAD ODOR CONTROL TECHNIQUES. *(Akushu boshi gijutsu no tenbo). Text in Japanese. Preprint, Osaka Technical Assoc. (Japan), and Japan Burner Research Assn., Osaka (Japan), 110p., 1974. 271 refs. (Presented at the Seminar on Bad Odor Control Techniques, 2nd, Osaka, Japan, Aug. 1, 1974.)*

Deodorization methods by absorption, direct combustion, catalytic oxidation, adsorption, static electrodes, and ozone oxidation are discussed. The main sources of odors in Japan are: chemical manufacturing industries, kraft pulp mills, petroleum refineries, and petrochemical industries. The next heaviest offenders are stockyards, feed and fertilization factories; then fermentation factories; followed by hormone and vitamin manufacturers utilizing fish and animal entrails and bones. Manufacturers of antibiotic drugs, refuse incinerators, sewage and excretion treatment plants, foundries, paint and coating material plants, and inorganic gas manufacturers are also odor sources. The static electrode method of odor control works on the same principle as the Cottrell electrostatic precipitator. Electrified or ionized odor elements and mists are captured on the electrodes by corona discharge. The advantage of this method is the combination of dust and gas collection and deodorization. Data on odorous substances solubility and mutual balance, and monograph bibliographies on acetone, butyric acid, ammonia, butylene, hydrogen sulfide, methyl amine, and trimethylamine, are presented in tables.

43660 **APTIC NO. 67263**

Takematsu, Toshiichi

A COMPARISON OF BOTTOM-FEED AND TOP-FEED REACTION SYSTEMS FOR HYDRODESULPHURIZATION OF COKER GAS-OIL DERIVED FROM TAR-SANDS. *(Taru sando yori bunri shita koka gasu oiru no datsuryu--hanno sosakeishiki ni yoru datsuryuritsu no hikaku). Text in Japanese. Tokyo Kogyo Shikensho Hokoku, 69(9):1-9, Sept. 1974. 9 refs.*

Top feed and bottom feed continuous flow systems for the hydrodesulfurization of a heavy coker gas-oil derived from Athabasca bitumen were compared. The specific gravity of the feed stock was 0.95 and the sulfur content was 3.4 wt%. The catalyst used was a commercially prepared mixture of the oxides of cobalt and molybdenum on alumina. In almost every respect the bottom feed system was more effective than the top feed arrangement. The greater heat transferring capability of the liquid phase and the mixing effected by the bubbling hydrogen improved temperature control within the reactor considerably. More extensive desulfurization (at higher space velocities) was possible with the bottom feed arrangement because of the longer residence time and improved temperature control. Fuel oil containing 1% S was produced at a space velocity of 3, 355 C, and 2000 psi with only 3-4% hydrocracking to low boiling fractions. Fuel oil containing only 0.5% S can be produced at similar temperatures and pressures at a space velocity of two.

43661 **APTIC NO. 67247**

Tamura, Takaai

ABSORPTION PROCESS FOR GAS SEPARATION. *(Assignee not given.) U. S. Pat. 3,797,201. 11p., March 19, 1974. 3 refs. (Appl. March 17, 1972, 6 claims).*

A process for separating a readily adsorbable gas from a less readily adsorbable gas in a mixture of the two is described in which a feedback step prior to the desorption step is introduced to achieve greater purity of separated components as compared with prior art adsorption-desorption processes. The gas mixture is introduced into an adsorption column containing an adsorbent prepared by dehydrating a tuff consisting of silica, alumina, and water and containing 1-10% by weight of alkali metal and alkaline earth metal oxides. The readily adsorbable gas is adsorbed and then recovered by desorption under reduced pressure. The purity of the readily adsorbable gas recovered is greatly increased by purging the adsorption column prior to the desorption step with a pure gas having almost the same composition as the adsorbed gas at approximately the same pressure as that in the adsorption step. Introduction into the column of a pure gas having the same composition as the less readily adsorbable gas prior to the introduction of the gas mixture allows for recovery of the less adsorbable gas in a high state purity also. (Author abstract modified)

43662 **APTIC NO. 67256**

Tanasawa, Yasusi, Mitsumasa Yamada, Mikiji Ito, and Kenji Ishiguro

EXHAUST GAS CLEANING DEVICE. *(Nippondenso Co., Ltd., Toyoto Jidosha Kogyo Kabushiki Kaisha, and Kabushiki Kaisha Toyota Chuo Kenkyusho, Aichiken (Japan)) U. S. Pat. 3,802,194. 12p., April 9, 1974. 6 refs. (Appl. Oct. 14, 1971, 10 claims).*

An exhaust gas afterburner for reducing motor vehicle exhaust emissions is described which overcomes problems of incomplete oxidation during warm-up and overheating with resultant thermal breakage at high speeds associated with similar devices for thermal treatment of exhausts. The device accomplishes the above by sensing the temperature of the combustion chamber and controlling accordingly the supply of secondary fuel and secondary air to the combustion chamber. The fuel and air supply for the afterburner are also responsive to the suction vacuum of the vehicle s engine and the vehicle speed. More secondary fuel and air are supplied during warm-up to avoid incomplete oxidation of the exhaust; while at high speeds, after the afterburner combustion chamber has reached normal reaction temperature, overheating is avoided by decreasing or eliminating the supply of secondary fuel and/or air to the afterburner. (Author abstract modified)

43663 **APTIC NO. 67221**

Tarves, Robert J., Jr.

METHOD AND APPARATUS FOR REMOVING OIL FROM EFFLUENT GAS. *(Air Pollution Specialties, Inc., Philadelphia, Pa.) U. S. Pat. 3,800,505. 5p., April 2, 1974. 8 refs. (Appl. Oct. 11, 1972, 10 claims).*

A method for removing oil from effluent gas is described which requires little maintenance and energy input as compared to other processes designed to accomplish the same task. Oil is removed from hot effluent gas by cooling the gas, scrubbing the gas in two stages, removing entrained droplets in a demister, and introducing the gas into an electrostatic precipitator. Approximately 99% (by volume) of the oil is removed from the gas following treatment in the electrostatic precipitator. A portion of the water used in a heat exchanger for cooling the gas may be used in the two scrubbing stages and recycled within the system. (Author abstract modified)

43664 **APTIC NO. 67203**

Tatterson, Benjamin F.

METHOD FOR TREATING COKE OVEN GAS. *(Koppers Co., Inc.) U. S. Pat. 3,798,308. 5p., March 19, 1974. 6 refs. (Appl. Jan. 19, 1972, 7 claims).*

An improvement in a process for converting hydrogen sulfide to sulfur associated with coke oven gas by-product recovery systems is described which eliminates or at least minimizes the requirements of tail gas incineration required for elimination of sulfur-containing gases such as sulfur dioxide from present Claus type processes. The tail gas is combined with crude coke oven gas in the gas by-product recovery system, and the SO_2 and other sulfur-containing gases react with the coke oven gas components or with components of the solutions employed in various phases of the by-product recovery system and are removed from the combined gases or pass through the recovery system unchanged for eventual burning or venting to the atmosphere in less objectionable concentrations. (Author abstract modified)

43665 **APTIC NO. 67322**

Trindade, Sergio C., Jack B. Howard, Henry H. Kolm, and Gary J. Powers

MAGNETIC DESULPHURIZATION OF COAL. *Fuel, vol. 53:178-181, July 1974. 5 refs.*

An experimental separator consisting of a column, packed with either steel wool or screens, inserted in the bore of a solenoid magnet was employed to study high-gradient magnetic coal desulfurization in cool-water slurries, with particle size fractions in the range of 0-600 micron and slurry velocities up to 4.0 cm/sec being studied. Practically all of the liberated pyritic sulfur was removed magnetically at a field strength of 5 times 10 to the six divided by pi amps/m, and up to 90% of the solid material fed to the separator was recovered. The data confirmed the effects of particle size and slurry velocity that were predicted by a theoretical model based on the force balance on a mineral particle in the vicinity of a magnetized strand. An economic analysis based on a conceptual continuous magnetic cleaning plant indicated that the process is commercially attractive. (Author abstract modified)

43666 **APTIC NO. 66632**

Uejima, Sekiya

AUTO-AIR FILTERS. *(Oto ea firuta ni tsuite). Text in Japanese. Kenchiku Setsubi (Architectural Equipment), 25(6):25-28, June 1974.*

A new type of automatic air filter for a ventilation system in buildings, subway stations, and subterranean shopping centers and parking lots was developed. The maintenance cost of air filters is considerable, and an automatic cleaning device for air filters such as the multi panel filter and auto-winding filter have been developed previously. The new auto-air filter is connected to a vacuum cleaner system with a cyclone or bag filter which is controlled by a timer or differential pressure regulating switch. The auto-air filter may be connected to a central vacuum system when a large number of air filters is used on one area, which is economically more advantageous. The filter is made of fire-resistant nylon net with electrically implanted fibers. The structure of the auto-air filter with stationary filter and movable vacuum suction inlet and the operational mechanism are described with a schematic diagram. The performance data of an auto-air filter using three types of filter materials and the economical evaluation are presented. The specifications of two models of auto-air filter are also given.

43667 **APTIC NO. 66980**

Waldmann, Hans

PROBLEMS OF ENVIRONMENTAL PROTECTION IN THE VEB COMBINE BLACK PUMP. *(Probleme des Umweltschutzes im VEB Gaskombinat Schwarze Pumpe). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 24-31.*

The VEB combine Black Pump (Schwarze Pumpe) in the German Democratic Republic operates three strip mines with a combined output of 100,000 tons of soft coal/day, briquetting plants with a capacity of 2400 tons/day, a city gas production plant with an output of 9 million cu m/day, three power plants, and one coking plant. In 1968 the waste gas cleaning facilities and in part also the waste water purification plants were at the developmental level of the 1940s and 1950s. An extensive program to improve the facilities has already borne fruit. Over the past three years well over 50 million East German Marks have been spent to increase the availability of the electric gas cleaning equipment from 60 to 90% percent of the time, reduce the dust emission from the briquetting plants by modification of the production process, and for other measures. The gas from the gas cleaning process by the rectisol method is burned in the power plant after it has passed a sulfosolvan and Claus plant for recovery of elemental sulfur. The annual production of elemental sulfur amounts to 10,000 tons. Through the desulfurization process a reduction of the SO2 emission by 20,000 tons/annum has been achieved. Odorous gases are condensed together with coke oven gases, cleaned and mixed with the city gas. Odorous gases from waste water purification and from tanks will be burned in thermal and catalytic afterburners. A reduction of the emissions of phenol from 3380 tons/annum in 1971 to 280 tons/annum in 1975 and of ammonia from 1480 tons/annum in 1971 to 90 tons/annum is being accomplished.

43668 **APTIC NO. 66646**

Weitzel, Hans

VENT AIR INCINERATOR AT THE BAYER PLANT AT DORMAGEN. *(Abluftverbrennungsanlage im Bayerwerk Dormagen). Text in German. Umwelthyg., 25(8):175-176, 1974.*

The new central vent air incinerator plant built at the Bayer plant at Dormagen, West Germany, is described. The incinerator, designed for the incineration of 15,000 cu m vent with organic, mostly malodorous, components hourly, is composed of a cylindrical combustion chamber 15 m in length and 1.5 m in diameter which is subdivided into a firebox at 1200-1400 C, and a combustion chamber with an operating temperature of 800 C, with air supplied to both compartment. The mixing chamber, constituting the last stage of the incinerator, receives 60,000 cu m of slightly polluted, odorous vent air for deodorization and cools the combustion gases to 300 C prior to discharge through a 130 m stack. The incinerator can be fired by fuel oil or natural gas.

43669 **APTIC NO. 67216**

Wiley, Robert F.

CATALYTIC CONVERTER. *(Corning Glass Works, Corning, N. Y.) U. S. Pat. 3,801,289. 5p., April 2, 1974. 7 refs. (Appl. May 19, 1972, 6 claims).*

A catalytic converter for oxidation of internal combustion engine exhausts is described which overcomes problems resulting from thermal expansion of core members and casings at a relatively low cost as compared to prior art solutions. The converter consists of pairs of circular and generally frusto-conical or funnel- shaped and concentric metal housings or casings forming a container surrounding a circularly cylindrical honeycomb core catalytic member composed of a material having high temperature durability and a low coefficient of thermal expansion, such as a refractory ceramic material. The container is designed to compensate for the differences in thermal expansion of the converter material and the metal material of the housing assembly. Thermal insulation material may be provided between the walls of the concentric casings. (Author abstract modified)

43670 **APTIC NO. 66947**

Winkler, H. D.

MEASURES FOR REDUCING EMISSIONS FROM BRICK KILNS. *(Massnahmen zur Emissionsminderung bei Ziegeleien). Text in German. Gesundh.-Ingr., 95(9):267-271, 1974. 8 refs. (Presented at the Second Symposium on Branch-Specific Emissions, Fluorine Emissions by Brick Kilns, Munich, Feb. 1, 1974.)*

For the reduction of fluorine emissions from brick kilns in principle two different methods are applicable, chemisorption and absorption. The dry chemisorption process is in general preferred over of the wet absorption process because it avoids the waste water problem. With the injection of pulverized calcium hydroxide into the flue gas flow a direct reduction of the gaseous fluorine compounds as well as of the oxides of sulfur can be achieved. A schematic diagram of the process is given. With this method clean gas concentrations of around 5 mg F/cu m could be achieved. Essential for a sufficient binding of the pollutants is a long residence time. Therefore the method is applicable only if the flue gas ducts are longer than 10 m. The particulate emission rises through the injection of pulverized calcium hydrate. A dust collector is therefore indispensable. The costs are lowest if a cyclone is installed for this purpose. Better results are achieved with a cloth filter, however. In the latter case the operating costs are as high as that of acid scrubbing. The dry system is in some plants presently in operation, however without dust collectors. Two plants in West Germany have been equipped with wet absorbers. For the collection of gaseous fluorine compounds, acid absorption with water and subsequent neutralization with lime-milk was found most suitable. Clean gas concentrations of less than 5 mg F/cu m were achieved with this method.

43671 **APTIC NO. 67205**

Woollenweber, William E.

APPARATUS FOR REDUCING POLLUTANTS IN ENGINE EXHAUST GASES. *(Wallace-Murray Corp., New York) U. S. Pat. 3,798,906. 4p., March 26, 1974. 5 refs. (Appl. May 22, 1972, 3 claims).*

A combination thermal reactor and turbocharger apparatus for achieving improved oxidation of internal combustion engine exhausts and thus reducing hydrocarbon and carbon monoxide emissions is described. A multistage exhaust manifold thermal reactor with a turbine component interposed between two of the reactor stages receives exhaust gases from the engine exhaust manifold. The turbocharger which air-charges the cylinders of the engine is driven by its turbine component through which heated gases passing between stages of the thermal reactor are expanded. The arrangement thus allows for more complete chemical reaction to occur and at the same time extracts energy from the reaction process. (Author abstract modified)

43672 **APTIC NO. 66635**

Yamabe, Takeo and Shinji Takai

ADSORBENT. *(Kyuchakuzai). Text in Japanese. (Mitsubishi Chemical Engineering Co., Tokyo (Japan)) Japan. Pat. Sho 49-27512. 3p., July 18, 1974. (Appl. July 6, 1970, 1 claim).*

Orthophosphates of iron, aluminum, and chromium are used as packing material in adsorption columns. These adsorbents are effective for polar molecules of a high, dielectric constant, such as water, hydrogen sulfide, ammonia, sulfur dioxide, carbon dioxide, carbon monoxide, methanol, esters, ketones, aldehydes. Consequently, the adsorbents are useful for selective adsorption separation of gaseous and liquid mixtures of different dielectric constants, as well as for use as catalyst support. It is possible to separate liquid mixtures, where the boiling points are so close that distillation separation is ineffective. Operational temperatures are not restricted, but somewhat more effective adsorption occurs at lower temperatures--from room temperature down to below 0 C. The adsorbents can be regenerated by heating to a temperature above the boiling point of the adsorbed material, or by passing through the adsorbents, an inert gas heated to the temperature above the boiling point of the adsorbed material.

43673 **APTIC NO. 66670**

Yamaguchi, Takaaki

DESULFURIZATION OF FUEL OIL. *(Jiyu no datsuryu). Text in Japanese. Doryoku (Nihon Doryoku Kyokai Kaiho), (J. Japan Power Assoc.), 24(129):21-27, Jan. 1974.*

The process of desulfurization, hydrogenation, hydrogenation on an industrial scale, the direct method of desulfurization, the indirect method of desulfurization, and economical problems of fuel oil desulfurization are discussed. The materials in the indirect desulfurization are heavy gas oil, vacuum gas oil, deasphalted oil and extract. These are all distillate oils and contain less than 10 ppm of asphaltene and less than 0.1 ppm of metal. Therefore, the amount of the catalyst required is one half of the direct method and the life of catalyst is twice longer; the hydrogen consumption is also about one half. It seems the indirect method is more advantageous than the direct method, but in reality, if normal pressure residue oil is used as the base, the desulfurization limit is 1.0 wt% for the direct method and the rate, 67%, for the indirect method, these figures are 1.7 wt% and 43% respectively. Therefore, in order to reach the regulation fuel standard of 1.5% sulfur content, the indirect method is insufficient. The system requires a large amount of energy, such as electric power, steam, fuel, naphtha, and liquefied petroleum gas; the heat may be recovered to a certain extent, but the high temperature reaction gases must be cooled with a large amount of water. All in all, 8 to 10% of the material oil will be consumed for the operation of the system when the total energy is converted into oil.

43674 **APTIC NO. 66647**

Yavorskiy, V. T., V. F. Melnik, Z. L. Konovalenko, Y. A. Kalymon, and M. A. Menkovskiy

ABSORPTION OF HYDROGEN SULFIDE FROM GASES BY THE QUININE METHOD IN A CHAMBER WITH S-SHAPED ATOMIZERS. *(Absorptsiya serovodoroda iz gaza khinonnym metodom v kamere s S-obraznym razbryzgivatelem). Text in Russian. Zh. Prikl. Khim., 47(6):1294-1298, 1974. 17 refs.*

The effects of different parameters on the efficiency of hydrogen sulfide absorption by the quinine method in a chamber with S-shaped rotary atomizers were studied in laboratory experiments. The H2S concentration ranged from 0.5 to 2%. Desorption was done by air blow. At a rotation speed of 1250 rpm, a quinine concentration of 1 g/l, a flow rate of 0.01 m/sec, and a temperature of 20 C, the absorbent excess coefficient was varied between 0.6 and 3. The H2S absorption efficiency was dependent on the absorbent excess coefficient and on the H2S partial pressure in the gas. The optimum of the absorbent excess coefficient was in a range of 1.9-2.1. Further increase in this coefficient had little effect on the rate of absorption.

43675 **APTIC NO. 67227**

Zankowski, Arthur

APPARATUS AND METHOD FOR REDUCING HARMFUL PRODUCTS OF COMBUSTION. *(Azapco, Inc., Fayetteville, N. Y.) U. S. Pat. 3,800,533. 7p., April 2, 1974. 11 refs. (Appl. June 13, 1972, 12 claims).*

A method utilizing vaporized fuel charge, exhaust recirculation, and a thermal reactor device for reducing hydrocarbon, carbon monoxide, and nitrogen oxide emissions from combustion processes, particularly automotive internal combustion engines, is described which allows conventional engines using commercial grade gasoline to meet established acceptable emission limits. The fuel charge is in vaporized form and consists of gaseous hydrocarbon fractions mixed with air or other suitable carrier gas which are provided directly to the engine fuel intake without need for carburetion or atomization as with liquid fuels. The vapors are taken from an enclosed vessel containing a continually replenished supply of the fuel in liquid form. The engine exhaust is discharged into a thermal reactor wherein carbon monoxide in the exhaust is oxidized without further combustion. After exiting from the thermal reactor the exhaust gas flow is divided so that a portion is released to the atmosphere and a portion is returned to the vessel holding the liquid fuel being vaporized and provided to the engine intake.

43676 **APTIC NO. 66629**

THE DIRECT GAS COMBUSTION DEODORIZATION APPARATUS BY EHARA INFILCO. *(Ehara Infilco no chokka gasu nensho dasshu sochi). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):12-13, Aug. 1974.*

It is necessary to remove more than 99.9% of the odorous compounds from a gas mixture, since only 65% of the odor can be eliminated even if 99% of the components are removed. A direct gas combuster was developed using a special burner. Gas was introduced into the combustion chamber where it was burned by a direct flame and was mixed ideally with the flame. The resulting gas remained in an oxidation chamber for a given length of time to ensure complete decomposition. The apparatus was designed to accommodate a highly efficient heat exchanger, waste heat boiler, condenser, and cyclone in a compact way. It offers the following characteristics: high deodorizing efficiency; no secondary pollution; simple structure and semi-automatic controlled; and low fuel cost. The apparatus can be used in chemical plants, printing plants, ink manufacturers, and fertilizer manufacturers.

43677 **APTIC NO. 66636**

LD STEELWORKS. *(l acierie LD). Text in French. Rev. Met. (Paris), 71(3):247-261, March 1974.*

A new LD steelwork built by Solmer in France and its air pollution control equipment are described. The flue gases, collected by means of individual, water jacket-cooled exhaust units are cooled in a cooling tower with water spray for the subsequent two-stage wet type dust separation. Following droplet separation and vapor condensation, the carbon monoxide present in the dedusted flue gases is burnt off in torches. Separate collection and cleaning equipment are provided for the charging and casting operations.

43678 **APTIC NO. 66676**

CAPILLARY ABSORPTION DEVICE FOR DEODORIZATION AND DETOXIFICATION. *(Dasshu, datsu yugai gasuyo mosaikanshiki kyushu sochi). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):16-17, Aug. 1974.*

A deodorizer consisting of an absorbing tower, capillary plates, exhaust gas blower, absorbent circulating pump, circulating liquid basin, circulating liquid inlet and outlet tubes, and mist separator is described. The characteristics of the apparatus are: multilayered capillary plates to eliminate the problem of pressure loss and heterogeneity of previous porous plates; capability of treating a gas mixture by a single tower, thus reducing the operating cost; high gas-liquid contact efficiency so that the consumption of absorbent is greatly reduced; the tower structure is simple and the capillary plates are semi-permanent; no high stack is needed due to the high efficiency of absorption; recovery of concentrated gas is possible since the absorbent is recycled repeatedly; and no cooling apparatus is required except for very high temperature gas. Typical examples of gas removal are: sulfuric acid mist, 100%, sulfur dioxide, 98.5%; hydrochloric acid and hydrogen chloride gas, 98% to 99.5%; chlorine, more than 99%; and hydrogen bromide, more than 99%. The apparatus is suitable for various plants, ranging from slaughterhouses to glass manufacturing plants.

43679 **APTIC NO. 66695**

Japan Fuel Assn. Kansai Branch and Nenryo oyobi Nensho, Inc.

A PANEL DISCUSSION ON BOILER POLLUTION CONTROL. *(Boira kogai no boshi ni kansuru zadankai kiroku). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(10):62-82, Oct. 1974.*

The minutes of a panel discussion on boiler pollution control held on June 15, 1974 are presented. The subjects of discussion were pollution control measures for medium and small sized boilers, measures against corrosion of boiler desulfurization systems, measurement instruments for nitrogen oxides, control measures for NOx emission from boilers, fuel conversion, the future status of fuels, measures for preventing accidents due to deterioration of boiler materials with time, continuous blow systems and oxygen control methods, the effect of mixing water into fuel, the effect of the addition of O2 on combustion, and improvements in thermal efficiency.

43680 **APTIC NO. 67245**

Le Suer, William M.

COMBUSTION PROCESS AND FUEL COMPOSITIONS. *(The Lubrizol Corp., Wickliffe, Ohio) U. S. Pat. 3,798,012. 10p., March 19, 1974. 1 ref. (Appl. June 9, 1971, 22 claims).*

A method for reducing black exhaust smoke from diesel and jet internal combustion engines used to power heavy automotive equipment, ships, and trucks is described. The fuel is burned in the presence of at least 0.01% by weight of a metal salt of an inorganic acid such as carbonic, sulfurous, or sulfuric acid. The metal is a Group I or Group II metal and has a particle size less than about 800 microns. The metal salts serve as smoke- suppressing agents in the process, with the effectiveness being dependent on the physical state and chemical composition of the particular metal salt. Smaller particle sizes are preferred, with sizes of between 0.0004-50 micron being especially desirable. The smoke suppressing agent must be in finely divided form at the time when combustion occurs, though the physical state of the smoke suppressant prior to combustion is not critical. The metal salt may be chemically combined with another substance in the form of a chemical complex which is capable of releasing the smoke suppressing agent in the desired particle size during fuel combustion.

43681 **APTIC NO. 67356**

Environmental Protection Agency, Research Triangle Park, N. C., Technology Assessment and Evaluation Branch

AN EVALUATION OF THE HYDROCATALYST CORPORATION S PRE-COMBUSTION CATALYST EMISSION CONTROL DEVICE. *Rept. 74-34 AW, 7p., June 1974. 1 ref.*

The Hydrocatalyst Corp. s pre-combustion catalyst emission control device was evaluated. Initial testing after installation of the device on a 1970 Valiant showed a 26% increase in hydrocarbons, a 73% increase in carbon monoxide, no change in nitrogen oxides, and a 4% decrease in fuel economy compared to the baseline results. After a 1500 mi accumulation, there was a 15% increase in hydrocarbons, a 93% increase in CO, a 2% increase in NOx, and an 11% decrease in fuel economy compared to baseline. Further enleanment of the mixture resulted in a 24% hydrocarbon increase, a 58% CO increase, an 8% NOx increase, and an 8% decrease in fuel economy compared to baseline. The unit was redesigned, but not retested.

1973

43682 **APTIC NO. 66747**

Adam, D. E., S. Sack, and A. Sass

THE GARRETT PYROLYSIS PROCESS. *Preprint, American Inst. of Chemical Engineers, New York, 17p., 1973. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 15, 1973, Paper GR and D 73-034.)*

A description of the Garrett pyrolysis process for the gasification of coal is described along with laboratory and pilot plant results and an engineering appraisal of the capital and operating costs of a 250 MM SCFD commercial plant. Pulverized coal is fed to a mixing chamber where it is contacted with hot recycle char which provides the heat required for pyrolysis which occurs at approximately 50 psig pressure and 1600 F. The pyrolysis gas is separated from the char in a series of cyclones, with a portion of the char being withdrawn as product and another portion being partially combusted and recycled to provide pyrolysis heat. The sensible heat contained in the combustion gas is recovered in further processing. Laboratory results indicate a heating value for the gas of 600-650 Btu/SCF, with the carbon rich char residue being an ideal rated fuel for power plant use. Process economics show a significant savings of 20-34 cents/MM Btu when compared to the Lurgi process.

43683 **APTIC NO. 67324**

Adt, R. R., Jr., D. L. Hershberger, T. Kartage, and M. R. Swain

THE HYDROGEN-AIR FUELED AUTOMOBILE ENGINE (PART 1). *Intersoc. Energy Conversion Eng. Conf. Proc., 8th, Philadelphia, Pa., 1973, p. 194-197. 3 refs. (Aug. 13-16.)*

A hydrogen-air fueled 195 cu in Pontiac 4 cylinder engine is described along with performance curves and emission data. Hydrogen passes through individual feed tubes to each cylinder and exits through induction ports machined in the intake valve seats. Hydrogen is obtained in a compressed gas form, with metering valves adjusted to give a uniform distribution of the gas to the cylinders. Nitrogen oxide levels in the exhaust during dynamometer testing are 2.2 ppm, except at advanced spark settings of 60 degrees where they reach 2.5 ppm. Greater part load efficiencies are realized compared with throttled gasoline engines.

43684 **APTIC NO. 67297**

Bazelmans, C. L., F. T. Binford, Ralph D. Dunlevy, P. A. Haas, J. R. Hightower, and J. M. Holmes, E. B. Morris, J. P. Nichols, Sam Ruggeri, and Royes Salmon

STUDY OF OPTIONS FOR CONTROL OF EMISSIONS FROM AN EXISTING COAL- FIRED ELECTRIC POWER STATION (FINAL REPORT). *Atomic Energy Commission, Oak Ridge, Tenn., Oak Ridge National Lab., Ohio Valley Electric Corp., and American Electric Power Service Corp., 332p., Sept. 1973.*

NTIS: ORNL-TM-4298

Alternatives for the reduction of sulfur oxide emissions from an existing 1300-MW coal-fired electric power station are compared with respect to technological feasibility, practicability, and cost. The principal near term application options are low sulfur fuel derived from petroleum and low S western coal. The long-term outlook for low S fuel oil is for continued scarcity, high price, and unreliability of supply. Low S coal has high transportation cost and may cause derating of plants designed for eastern U. S. bituminous coals. Stack gas treatment processes such as scrubbing with limestone slurry do not yet have the degree of operating reliability needed for power plant use. Processes for treating stack gas may achieve 90% reliability by 1976, but implementation by 1977 requires selection of a process and initiation of engineering by 1974-1975. Other possible options are low Btu gas, solvent refined coal, and liquid fuels produced from coal. Low Btu gas has the advantage of a high degree of S removal and the potential for future use in combined cycles of high efficiency. (Author abstract modified)

43685 **APTIC NO. 67003**

Bellomo, Salvatore

PROVIDING FOR AIR QUALITY AND URBAN MOBILITY. *Highway Res. Rec., no. 465:1-13, 1973. 15 refs.*

NTIS: PB 227144

The process of incorporating air quality considerations in planning, the basic relations between transportation and air pollution, techniques for achieving air quality, and the institutional difficulties of implementing transportation control techniques are discussed in this discussion of ways in which air pollution considerations may be incorporated in the decision- making process. The air quality problem related to transportation is not solely a function of vehicle emissions, because factors such as wind, time of day, and physical barriers can affect the problem. Primary and secondary air quality standards established by Federal and State governments are discussed and tabulated. The relation of vehicle technology and the effects of speed, travel mode, and operation mode on emissions are described. Techniques of air quality control are grouped into programs oriented toward vehicles, traffic flow, and reduction of pollution concentration. Vehicle emission factors under various operating conditions and emissions from various types of vehicles are discussed. The Department of Transportation and the Environmental Protection Agency need to improve communication. Transportation control techniques may be used to achieve air quality, but some may infringe on mobility goals. Short-term actions aimed at ameliorating air pollution must aim at fostering communication among responsible agencies. Long-term actions require research and more analytical information. (Author abstract modified)

43686 **APTIC NO. 67281**

Decker, I. D., W. B. Hansel, R. J. McCrory, G. E. Moore, A. W. Percy, R. L. Cisco, R. C. Slawinski, E. Copony, and G. G. Sutcliffe

NOZZLES AND FITTINGS PANEL. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 37-47. (Dec. 4-5, 1973.)*

A panel discussion is presented on various nozzles and fittings designed to control hydrocarbon vapor refueling losses during tank loading and automobile filling. Descriptions and illustrations are given for such devices as hose loaders for bottom filling of storage tanks, Y-valves for bottom filling and unloading of transport trucks, vapor recovery loading arms for the conversion of tanks from top loading to bottom loading, coaxial vapor recovery systems for underground service station tanks which permit conversion to service station vapor recovery in less than 15 min at a cost of less than $100.00, and gasoline nozzles designed for vapor recovery and also for the removal of fueling vapors to a remote location for safety considerations. Recovery efficiencies of up to 99% are cited for some of the above devices.

43687 **APTIC NO. 66722**

DeMarco, Jack, Daniel J. Keller, Jerold Leckman, and James L. Newton

INCINERATOR EFFLUENTS AND THEIR CONTROL. *In: Municipal-Scale Incinerator Design and Operation (formerly titled Incinerator Guidelines--1969). Dept. of Health, Education, and Welfare, Washington, D. C., Bureau of Solid Waste Management, Public Health Service Rept. 2012, p. 46-50, 1973. 8 refs.*

GPO

Environmental pollution and its control from incineration processes are discussed. Operation of the tipping and storage areas can cause dust, litter, and noxious odor. Frequent sweeping and washing can aid control. Many plants are equipped with air purification systems which control dusts and odors. Fly ash is a principal product of combustion. The inorganic fraction of fly ash is usually the major constituents and consists mostly of oxides of silicon, aluminum, calcium, and iron. Dry fly ash should be stored in closed containers to prevent atmospheric dispersion.

43688 **APTIC NO. 66723**

DeMarco, Jack, Daniel J. Keller, Jerold Leckman, and James L. Newton

AIR POLLUTION CONTROL. *In: Municipal-Scale Incinerator Design and Operation (formerly titled Incinerator Guidelines--1969). Dept. of Health, Education, and Welfare, Washington, D. C., Bureau of Solid Waste Management, Public Health Service Rept. 2012, p. 51-61, 1973. 15 refs.*

GPO

The control of entrained particulates and gaseous pollutants from the incineration of solid waste is described. About 10 lb of fly ash are produced from the burning of 1 ton of solid waste. Adjustment of underfire may partially control these emissions. Over 99% of the flue gases are not air pollutants, but trace gases can cause odors or react with components of ambient air to form pollutants. Typical municipal solid wastes produce .00236 lbs/ton of aldehydes; 0.8 lbs/ton of hydrocarbons as methane; 0.51 lbs/ton carbon monoxide; and 2.7 lbs/ton nitrogen oxides. Odor control is achieved by dilution or by maintenance and adequate retention time and sufficient temperature to ensure complete combustion of hydrocarbon vapors to carbon dioxide and water. The sulfur oxide emissions are below restrictions, and restrictions on nitrogen oxides are not yet formulated. Particulate collection systems are discussed including their performance capabilities based upon objective test data, the state of the art of their development with respect to application to incinerators, and capital costs. The collectors discussed are settling chambers, wetted baffle-spray systems, cyclones and multiple cyclones, wet scrubbers, electrostatic precipitators, and fabric filters.

43689 **APTIC NO. 67294**

Duffy, T. E., J. R. Shekleton, R. B. Addoms, and W. A. Compton

LOW EMISSION COMBUSTOR/VAPOR GENERATOR FOR AUTOMOBILE RANKINE CYCLE ENGINES (FINAL REPORT). *International Harvestor Co., San Diego, Calif., Solar Div., Office of Air and Water Programs Contract 68-04-0036, Rept. EPA-460/3-73-004, RDR-1708-6, 361p., Oct. 1973. 18 refs.*

NTIS: PB 230896/AS

A low emission vapor generator for automotive Rankine cycle power plants was designed and tested. Major design features include: rotating cup fuel atomization and injection, fully modulated controls for air, fuel and water, symmetrical air distribution with no exhaust recirculation, flat spiral steam generator tube matrix with extensive use of finned tubing and a straight-through combustion gas flow path. A high degree of component integration was used to allow co-axial mounting of the fan and fuel cup with a single belt drive from a DC side mounted electric motor. A steam generator with an output of 1200 lb/hr at 1000 F and 1000 psia weighed emissions below the 1976 emission standards over a simulated driving cycle. (Author abstract modified)

43690 **APTIC NO. 67282**

Gockle, I. J., Y. C. Lee, John Perry, R. W. Taylor, V. R. Fusco, and A. Datis

EQUIPMENT PANEL. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 47-57. (Dec. 4-5, 1973.)*

Panel presentations are given on various devices for the displacement and/or recovery of hydrocarbon vapor emissions from service station storage tanks and automobile fueling. Types of equipment for controlling such emissions include: canisters of activated carbon for the adsorption of vapors; special nozzle designs for catching vapors as they exit as well as for preventing vapor escape by drawing in surrounding air; and refrigeration and circulation systems for liquefaction of hydrocarbon vapors. Some systems include on-site regeneration so that when hydrocarbons are being adsorbed in one canister of charcoal, for example, another canister is being regenerated by a vacuum pump, with the vapors then being taken from the pump and fed to a condensing unit, after which they are returned to the original storage container. Average vapor recoveries of between 75 and 90% are cited from test data with the above types of controls.

43691 **APTIC NO. 66740**

Greeley, R. S.

ENERGY, RESOURCES AND THE DEVELOPMENT. A SET OF PRESENTATIONS. *The MITRE Corp., Washington, D. C., Systems Development Div., Rept. M73-61, 77p., 1973. (Presented at the United States Information Agency Exhibit on Progress and the Environment, Poland International Trade Fair, Lodz, Poland, June 18-22, 1973.)*

NTIS: N74-19615

Five presentations on energy resources and their environmental impact are given. Topics covered include: fuel resources available to the world, including solar, nuclear fusion and fission, geothermal, tidal, hydro, and fossil energy sources; methods for improving the efficiency and economy of fuel use; an energy ethic involving changes in government regulations and tax policies and other institutions to promote efficiency and conservation in the use of fuels; advanced energy systems technology, including automobile engines, mass transit systems, pollution control devices, fuel cells, and magnetohydrodynamic production of electricity; and the need for a vigorous international research and development program to provide assurance for continued supplies of clean energy. Energy savings of 10-15% appear possible in the near term, with solar, fusion, and fission with breeding being cited as essentially infinite energy sources.

43692 **APTIC NO. 66896**

Higashino, Ichiro, Shigeyuki Morita, and Hiroshi Nakano

FEED BACK CONTROL OF AIR FUEL RATIO. *Mem. Fac. Eng., Osaka City Univ., vol. 14:47-59, Dec. 1973. 2 refs.*

An application of an electromechanical feedback control system is described for maintaining the air to fuel ratio of an automobile engine at a constant level and thereby reducing exhaust emissions. Feedback control of the air to fuel ratio is achieved by applying a peak seeking method to a single-peak characteristic of an ion current curve correspondong to the air/fuel ratio of the engine. Air/fuel ratio changes of equal to or less than 0.05 are achieved in laboratory experiments for any air/fuel ratio setting. Response of the device tested is limited by the use of a servo motor for the actuator, though employment of a fuel injection system as the actuator is expected to improve response time.

43693 **APTIC NO. 66804**

Hurn, R. W.

DIESEL EMISSIONS MEASUREMENT AND CONTROL. *Preprint, Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center, 18p., May 1973. (Presented at the Bureau of Mines Symposium on Diesel-Powered Equipment in Underground Mining, Pittsburgh, Pa., Jan. 30-31, 1973.) (Also: Presented at the Mine Inspectors Institute of America, Annual Meeting, 63rd, Checotah, Okla., June 10-13, 1973.)*

The measurement and control of diesel emissions are discussed in the context of safe use of diesel engines underground. Inadequate or failed ventilation is cited as the principal factor leading to dangerous levels of exhaust toxicants. Carbon dioxide in mine air should be monitored continuously to give an early indication of residual contamination beyond acceptable limits. Technology is available to minimize the hazards from carbon monoxide and oxides of nitrogen by reducing the amounts of these toxicants in diesel exhausts. Nitrogen oxide control methods include exhaust gas recirculation, fuel injection modifications, and water injection. Methods to control carbon monoxide, hydrocarbons, and odor include catalytic conversion or treatment of exhaust and fuel injection refinements. Smoke can be controlled by turbocharging and power limitation. (Author abstract modified)

43694 **APTIC NO. 67280**

Leiferman, M. W.

VAPOR CONTROL CONCEPTS. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 32-36. (Dec. 4-5, 1973.)*

Descriptions are presented for the four basic types of hydrocarbon vapor control systems for service stations, viz., activated carbon adsorption, refrigeration, refrigeration-compression, and displacement or balancing, with test data being supplied for the last mentioned system. The displacement or balance system consists of piping which transfers expelled vapors from the vessel being filled back into the supply vessel. During vehicle filling, the vapor from the vehicle tank is transferred to the underground storage tank; and during storage tank filling, this vapor is transferred into the delivery truck or trailer. Vapors in the truck are then recovered at the loading terminal. Test results indicate that a vapor recovery efficiency of greater than 92% is attainable for underground tank filling when the unloaded product temperature is up to 12 F higher than the underground product temperature. For vehicle tank filling an excess vapor volume is not generated when vehicle fuel temperature is higher than the dispensed liquid temperature; and when the initial fuel tank temperature is greater than the dispensed liquid temperature, a decrease in vapor volume occurs. A vehicle fueling vapor recovery efficiency of over 95% is attainable with a nozzle which seals effectively.

43695 **APTIC NO. 66827**

Marshall, William F.

NOX FROM DIESEL ENGINES -- CONTROL AND MEASUREMENT TECHNIQUES. *Preprint, American Inst. of Chemical Engineers, New York, 23p., May 1973. 10 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 75th, Detroit, Mich., June 3-6, 1973.)*

Several different types of diesel engines were studied to determine how emissions and engine performance are affected by engine modifications and adjustments made to reduce nitrogen oxide emissions. Exhaust levels of NOx were determined on a continuous basis by non-dispersive infrared combined with non- dispersive ultraviolet and by chemiluminescence; agreement between these two methods was generally good and both are well suited to engine studies. The best results in terms of emissions reduction with least penalty to engine performance were obtained with water induction, with NOx emissions being reduced by about 70% with a water rate/fuel ratio of one; 80% reductions were achieved with water rate/fuel rate ratios of 2. Exhaust gas recirculation was also effective in reducing NOx emissions, though engine performance was affected more than with water induction. Injection timing resulted in engine performance deterioration and increased smoke levels. The use of an aftercooler on turbocharged engines was also effective in reducing NOx emissions.

43696 **APTIC NO. 67277**

Martens, Stuart W.

AN AUTOMOBILE INDUSTRY VIEWPOINT (I). *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 9-11. (Dec. 4-5, 1973.)*

Onboard vehicle fuel evaporation controls are compared to service station controls for the reduction of refueling emissions of hydrocarbon vapors from the standpoint of effectiveness and time to reach full control effectiveness. Onboard systems considered involve the use of charcoal canisters for adsorption of the hydrocarbon vapors and a vacuum purge process to remove the adsorbed vapors, while most of the service station control concepts involve displacement to various means of disposal. The normal 10-15 year car replacement stretches out the time required to reach full control effectiveness for onboard systems as compared to station controls, using 90% refueling control as the goal. The regional approach using station control offers the possibility of very rapid progress where the need exists, without imposing the cost and inconvenience on those areas of the country not requiring control.

43697 **APTIC NO. 67285**

Martens, Stuart W.

CONTROL OF REFUELING EMISSIONS STATEMENT BY GENERAL MOTORS CORPORATION. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 77-90. 6 refs. (Dec. 4-5, 1973.)*

A discussion on the control of automobile refueling emissions for the State of California via vehicle onboard devices or service station controls is presented along with appended test results on a gasoline filler nozzle heat exchanger, service station activated carbon controls, the effect of dissolved refueling vapors on the Reid vapor pressure of storage tank fuel, and experimental onboard control devices. The nature of refueling emissions strongly suggests a regional control approach, via service station hardware since available service station controls appear applicable to all vehicles in the population as opposed to onboard control which is practical only for new car installations. Tests studying the effect of a heat exchanger as a part of the gasoline filler nozzle suggest that very little benefit is gained from such a combination. An activated carbon refueling emission control system for service stations is illustrated which collects the refueling emissions from the adsorbent via a vacuum purge process. Data from studies on the effect of expelled vapors upon the storage tank fuel Reid vapor pressure indicate that the tank will stabilize at a Reid vapor pressure no greater than 0.3 psi above present conditions.

43698 **APTIC NO. 66748**

McMath, H. G., R. E. Lumpkin, and A. Sass

PRODUCTION OF GAS FROM WEATHER SUB-BITUMINOUS COALS BY THE GARRETT FLASH PYROLYSIS PROCESS. *Preprint, American Inst. of Chemical Engineers, New York, 25p., 1973. 1 ref. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 15, 1973, Paper GR and D 73-033.)*

Laboratory pyrolysis reactor results are presented for the partial gasification of sub-bituminous coals using the Garrett flash pyrolysis process over a temperature range of 1500-1700 F. The process produces a high direct yield of hydrocarbons with a heating value of 600-650 Btu/SCF. Equivalent pipeline gas yields of 8500 SCF pipeline gas per ton of moisture-and-ash-free coal are obtained. The char has a high heat of combustion, a lower sulfur content than present coal, and ignition characteristics comparable to conventional coals, making it directly marketable as a fuel for electrical power generation. Data are presented for several western sub-bituminous coals from different areas, with no differences being obtained between the coals investigated. The process offers significant economic advantages and an increased operating reliability over other competitive processes. (Author summary modified)

43699 **APTIC NO. 66614**

Nagiyev, M. F., A. M. Aliyev, and R. A. Kasimova

DETERMINATION OF THE OPTIMUM VAPOR-GAS RATIO IN THE JOINT CATALYTIC CONVERSION OF METHANE AND CARBON MONOXIDE. *(Opredeleniye optimal nogo sootnosheniya par:gaz v protsesse sovmestnoy kataliticheskoy konversii metana i okisi ugleroda). Text in Russian. Azerb. Khim. Zh., no. 5-6:124-126, 1973.*

The optimum vapor-gas ratio in the joint catalytic conversion of methane and carbon monoxide was calculated. The optimum of the vapor-gas ratio was a function of the composition of the dry gas and of temperature. Calculations of the optimum vapor-gas ratio for reactor capacities ranging from 26.21 to 106.65 cu m/sec revealed a reduction of the optima from 0.16 to 0.11 with increasing CO content in the dry gas.

43700 **APTIC NO. 67283**

Nichols, Richard A.

HYDROCARBON EMISSION SOURCES AT SERVICE STATIONS. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 60-71. (Dec. 4-5, 1973.)*

Various approaches and their cost-effectiveness are examined for controlling hydrocarbon emissions at service stations resulting from service station tank re[illegible]eling and tank breathing losses and from automobile refueling losses. A vent line orifice appears to markedly improve efficiency over the straight vent line, and the leak-tight nozzle approach is judged as possible and very necessary. Charcoal regeneration off-site is the least expensive method for controlling service station refueling losses from a capital cost standpoint, while charcoal regeneration on-site and catalytic oxidation are second in cost. Compression-condensation vapor recovery equipment is more expensive, perhaps double the cost of the first two methods. The use of vacuum-assist devices in recovery systems involves a tradeoff between the efficiency of the recovery device and degradation in performance created by sucking in the added vapors. A 0.5 in. vent orifice provides 50% recovery under the same conditions that a three-eighths in. vent orifice provides 74% recovery.

43701 **APTIC NO. 67276**

Olsen, Donel R., John A. Gunderson, and Don K. Lawrence

CONTROL OF REFUELING EMISSIONS WITH ACTIVATED CARBON CANNISTER ON VEHICLE. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 5-8. (Dec. 4-5, 1973.)*

Bench tests were performed on an activated carbon canister control device for reducing hydrocarbon emissions resulting from automobile refueling. The test vehicle was a 1973 Ford Gran Torino with a 351 cu in. engine, selected as a representative passenger vehicle, while the control system utilized a 2000 g activated charcoal canister for adsorption of the hydrocarbon vapors. Refueling vapor losses during severe conditions were about 5.4 g per gallon of refill on the average without the proposed control system. The carbon canister effectively controlled refueling vapor losses, with no evaporative emissions being detected during test refueling; and driveability of the vehicle was satisfactory with the installed system. Exhaust emissions were increased in the case of carbon monoxide and decreased for nitrogen oxides; exhaust hydrocarbon levels remained about the same. The differential cost to the consumer for adding the refueling vapor control system was estimated at $4.85 per manufactured vehicle, with the incremental cost being returned to consumer after a 10 year period.

43702 **APTIC NO. 67284**

Olson, Donel R., John A. Gunderson, and D. K. Lawrence

APPENDIX. CONTROL OF REFUELING EMISSIONS WITH AN ACTIVATED CARBON CANISTER ON THE VEHICLE. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 73-76. (Dec. 4-5, 1973.)*

Tests with a 1973 Ford Gran Torino with a 351 cu in. engine were conducted to determine the technical and economic feasibility of using a carbon canister system on automobiles to control refueling vapor losses and to assess the system s effects on vehicle exhaust and evaporative emissions as well as on driveability. A canister containing 2000 g of activated carbon appears capable of effectively controlling refueling vapor losses and evaporative emissions without impairment to driveability. The differential cost to the consumer for adding the refueling control capability to an existing evaporative control system is estimated at $4.85 per manufactured vehicle, and the annualized cost effectiveness of the 2000 g carbon canister system is $0.18 per pound of hydrocarbon vapor recovered and 0.10 cents per gallon of fuel refilled. Addition of the system appears to increase carbon monoxide exhaust levels, reduce nitrogen oxide levels, and leave hydrocarbon exhaust emissions virtually unchanged.

43703 **APTIC NO. 67287**

Perry, John E.

VAPORTROL VAPOR RECOVERY SYSTEM. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 97-98. (Dec. 4-5, 1973.)*

A hydrocarbon vapor recovery system, known as Vaportrol, for use at service stations and wholesale dealer bulk plants is described which satisfies the most severe pollution control requirements safely and with excellent cost effectiveness. During a dump or at any other time when a positive pressure greater than three inches of water occurs, a pressure switch activates a timer control which turns on a circulation blower and a refrigeration blower. All of the vapors are caused to circulate across the condenser and return to the storage tanks. Some hydrocarbon vapors are condensed to liquid product on each pass across the condenser, and the vapor stream is cooled about 20 F. Conversion of a large volume of gas into a small volume of liquid and reduction of the bulk temperature of the vapor space permits a reduction in pressure to an equilibrium condition below the switch point. Two to four 15-minute cycles are required to reduce the pressure, and the system will typically operate for less than one hour per dump. Since the system operates on a demand basis, the cost of power is greatly reduced compared to a continuously operating unit. Total power consumption per day for a 200,000 gallon per month station operating 25 days per month, 12 hrs/day is estimated at 3 KW.

43704 **APTIC NO. 67005**

Revis, Joseph S.

SHORT-TERM TRANSPORTATION CONTROL STRATEGIES FOR AIR POLLUTION CONTROL. *Highway Res. Rec., no. 465:21-45, 1973. 11 refs.*

NTIS: PB 227144

Seven short-term transportation control strategies are identified as likely candidates to provide for short-term reduction in carbon monoxide emissions from motor vehicles and attainment of primary CO standards by 1975; inspection, maintenance, and retrofit; conversion to gaseous fuels; traffic flow techniques; bypassing through traffic; improvements in public transportation; motor vehicle restraints; and work schedule changes. Each strategy is discussed with the air pollution control potential, maximum feasible emission reduction, and institutional feasibility. The findings are based on a study of Chicago, Denver, Los Angeles, New York, San Francisco, and Washington, D. C. Emphasis was placed on identifying transportation controls that could be available within a period of 3 years, realistically subject to implementation by state and county governments, and institutionally and technically feasible. In addition, three of the control strategies (inspection, maintenance, and retrofit; traffic flow controls; and motor vehicle and public transport improvements) were tested through simulation methods applied to each of the six cities. The preliminary results of these tests are summarized as isopleths of pollution concentration for CO, hydrocarbons, and nitrogen oxides for the 1- and 8-hour periods of maximum vehicle miles travelled for a base year projected to 1977 under both controlled and uncontrolled (no transportation control strategy) conditions. (Author abstract modified)

43705 **APTIC NO. 67022**

Schwartz, S. H. and R. N. Salzman

MODEL STUDY OF DISPERSION OF PARTICULATES WITH THE LIMESTONE INJECTION METHOD. *American Society of Mechanical Engineers, Am. Soc. Mech. Engrs. Meet., Flow Stud. Air Water Pollut., June 1973, p. 183-192. 16 refs. (June.)*

Results of a study modeling the penetration and dispersion associated with the dry limestone injection process for a steam generating station are presented. The dimensionless parameters used in designing and selecting the operationg conditions for the model to match the actual system are discussed. The effects of selecting different nozzle locations and variations of turbulence were experimentally determined. The data from the model study indicated that the location of the injection level had a more significant effect upon the dispersion of the powder than did free steam turbulence over the range of turbulence intensities from 0.025 to 0.10. These model results are compared with those from a full-size boiler unit and the trends indicated that the process has been successfully scaled. Overall, the technique used in obtaining the scaling parameters for this complex flow process appeared to be correct and could be used for similar model studies. (Author abstract modified)

43706 **APTIC NO. 67278**

Simpson, Bruce

AN AUTOMOBILE INDUSTRY VIEWPOINT (II). *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 12-15. (Dec. 4-5, 1973.)*

The problem of hydrocarbon vapor emissions resulting from automobile refueling is considered in terms of a cost- effectiveness appraisal of three alternate control systems, viz., car containment, station containment for all vehicle refueling, and station containment for new vehicle refueling. The second alternative is the most cost-effective arrangement in terms of cumulative gallons saved over a period of 10 yrs and the cumulative cost over that period, with a cost of about 15 cents per pound of hydrocarbons not emitted being estimated. The last alternative is slightly less cost-effective but much more practical, with a cost per pound of around 20 cents. The cost of car containment is around 35 cents, though it saves pounds of hydrocarbon emissions. Methods for refueling containment at the station include vapor displacement and exchange systems and tight fill nozzles.

43707 **APTIC NO. 67286**

Simpson, Bruce

A COST-EFFECTIVENESS APPRAISAL OF ALTERNATE SYSTEMS FOR NO-LEAD SAFEGUARD AND REFUELING VAPOR CONTAINMENT. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 91-95. (Dec. 4-5, 1973.)*

A cost-effectiveness appraisal is given for three alternative systems designed for refueling hydrocarbon vapor containment and no-lead safeguards for automobiles designed to operate on lead-free gas only. The alternatives are: vapor containment within the vehicle; vapor containment by stations (installations pro-rated for new vehicles only); and vapor containment by station where all equipment is installed the first year of implementation. Virtually complete control of station refueling vapor losses and both new and older car refueling vapor emissions is the most cost-effective approach, assuming that a practical solution can be found for handling older cars. Control of station and pro-rate control of new car refueling losses is only slightly less cost-effective. The timing for vapor containment systems is estimated to require 42 months because the state of the art is not as well known as that of no-lead control systems.

43708 **APTIC NO. 66790**

Tufte, P. H., E. A. Sondreal, K. W. Korpi, and G. H. Gronhovd

PILOT PLANT SCRUBBER TESTS TO REMOVE SO2 USING SOLUBLE ALKALI IN WESTERN COAL FLY ASH. *Preprint, 46p., 1973 (?). 10 refs. (Presented at the Lignite Symposium, Grand Forks, N. Dak., May 9-10, 1973.)*

Tests were conducted with two pilot wet scrubbers on a high alkali lignite fly ash and a low alkali subbituminous coal ash to study the potential of using the soluble alkali in the ash as the absorption agent in a wet scrubber for the removal of moderate amounts of sulfur dioxide. Sulfur dioxide removals from the high alkali lignite ash were as high as 40%, with the quantity of fly ash typically found in flue gas from a pulverized-coal-fired boiler, while SO2 removals from the low alkali coal ash were about 20%, with the quantity of fly ash typically found in cyclone-fired boiler flue gas. Tests on the larger of the two scrubbers using flue gas from a pulverized-coal-fired boiler burning low alkali coal resulted in an SO2 removal of 35%. The results indicated that SO2 can be removed from flue gas to the extent of 20-60% using wet scrubbing with ash alkali from the two western coals, with the removals being sufficient to bring stack emissions into compliance with federal and state standards for some coals. Scale buildup due to precipitation of gypsum in the scrubber was a problem when the system was operated at the saturation level. (Author summary modified)

43709 **APTIC NO. 67194**

Yamada, Tamotsu, Shoichi Tomonari, and Takaya Iida

DESULFURIZATION OF COMBUSTION EXHAUST BY ACTIVE SODA ASH. *(Kassei sodabai no yoru haien datsuryo no kenkyu). Text in Japanese. Nagoya Kogyo Daigaku Gakuho (Bull. Nagoya Inst. Tech.), no. 25:395-403, 1973. 5 refs.*

The mechanism and rate of reaction for sulfur dioxide removal from combustion exhaust using active soda ash was examined. The soda ash absorbed SO2 at a rate of 1 mg/sq cm min below 170 C, with the sodium sulfite produced being oxidized to sodium sulfate above 220 C. The absorption rate fell slowly after more than 50% sodium sulfite accumulated. A multi-floor type apparatus was constructed in which soda ash charged on the top floor of the apparatus was transported to the lower floors for absorption of SO2. The apparatus desulfurized more than 97% of SO2 from a model exhaust gas containing 0.1-0.25 SO2, 6-25% vapor, and the remaining air at 150-300 C, using granular soda ash of 50-325 Tyler mesh and a mol ratio of ash to SO2 of 0.1-2.5.

43710 **APTIC NO. 67290**

Emco Wheaton, Conneaut, Ohio

EMCO WHEATON COAXIAL FITTING VAPOR TRANSFER TEST RESULTS. *Preprint, 18p., July 1973.*

Test results are presented of 11 different tests on Emco Wheaton s coaxial fitting vapor transfer equipment. Use of nonleaded fuel gave lower percentages of vapor transferred (98.9, 97.3, and 95.6%). Other tests showed 98.4, 99.9, 99, 98.5, 99, 94, 94, 90, 98, 98, 98, 100, 100, 100, 100, 100, 98.6, 100, 98.3, 99, 100, 94, 96, 96.8, 96.5, 95.5, 90.5, and 100% vapor transferred.

1972

43711 **APTIC NO. 66780**

Ariman, T., R. J. Young, K. T. Yang, and R. L. Hosbein

ON PARTICLE COLLECTION BY LIQUID SCRUBBING. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 615-632. 11 refs. (April 20-21.)*

A design criteria leading to successful application of the Detrick-Jens wet scrubber in the solution of air pollution problems was developed. A systematic approach was used based on a combination of theoretical analysis and correlation with experimental results from testing of a model scrubber and from field data on Detrick-Jens scrubbers already in operation. A mathematical model for particle removal efficiency of the scrubber was formulated. A computer program was developed based on the model and experimental correlation. The first capture mechanism is very effective for the removal of large particles while the second one becomes dominant for relatively small particulates. (Author conclusions modified)

43712 **APTIC NO. 66825**

Ball, F. J., G. N. Brown, J. E. Davis, A. J. Repik, and S. L. Torrence

RECOVERY OF SO2 FROM STACK GASES AS ELEMENTAL SULFUR BY A DRY FLUIDIZED ACTIVATED CARBON PROCESS. *Preprint, American Chemical Society, New York, Div. Fuel Chemistry, 16p., 1972. 4 refs. (Presented at the American Chemical Society, National Meeting, 164th, New York, Aug. 31, 1972.)*

A dry fluidized activated carbon process is being developed at the continuous pilot stage for recovery of sulfur dioxide from waste or flue gases as elemental sulfur. The SO2 is removed from the gases as sulfuric acid on carbon by sorption, catalytic oxygenation, and hydrolysis. This is accomplished in a fluidized bed sorber cooled by water sprays at 150 to 300 F. An important development is the direct conversion of sorbed sulfuric acid to elemental sulfur by reaction with internally produced hydrogen sulfide. The product sulfur is recovered as molten sulfur by vaporization at 1000 F and condensation. The residual sulfur on the carbon is then reacted with hydrogen at 1000 F to produce the required H2S and complete the carbon regeneration. All regeneration steps employ fluid bed reactors. Adsorption of SO2 at up to 25,000 cu ft/hr was demonstrated on power boiler flue gases and simulated Claus tail gas. Feasibilities of the regeneration steps at comparable carbon rates were shown, and the continuous integration of the pilot equipment was achieved. The current use of fluidized carbon beds to continuously desolvate air streams of up to 500,000 cu ft/min with minute carbon attrition should expedite scale-up. (Author abstract)

43713 **APTIC NO. 66794**

Bly, Robert L.

CLEAN EXHAUST... GOOD DIESEL ENGINE PERFORMANCE. *Allis-Chalmers Eng. Rev., 37(4):9-13, 1972.*

Prevention maintenance measures for assuring clean diesel engine exhaust are reviewed along with some commercial control devices designed to achieve cleaner burning. The most common cause of excessive and dark diesel exhaust smoke is malfunction of the air induction system. This can occur as a result of plugged air cleaners, moisture-induced air cleaner restriction (for dry-type cleaners only), and leaks between the air cleaner and engine that allow unfiltered air into the engine. All of these possibilities should be checked at regular maintenance intervals. The fuel supply system also requires regular inspection and maintenance to insure that the correct air-to-fuel ratio is achieved for clean and efficient combustion. Compression is also important to efficient combustion; some of the most commonly found deficiencies associated with compression leaks are leaking head gaskets, leaking intake and exhaust valves, worn or broken pistons, rings, or sleeves, leaking injectors or nozzle gaskets, and cracked cylinder heads. Blue exhaust is an indication of excessive burning of lubricating oil resulting from mechanical deficiencies such as leakage of oil past the piston rings. Control devices designed to improve clean burning through more efficient air intake or by proportioning fuel delivery and air pressure during acceleration include turbochargers and aneroid units.

43714 **APTIC NO. 67387**

Bracco, F. V. and W. A. Sirignano

THEORETICAL ANALYSIS OF WANKEL ENGINE COMBUSTION. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1146-1151. 2 refs. (Sept. 25-29, Paper 729171.)*

A one-dimensional model for the spark ignition Wankel engine combustion is presented. Except for the geometrical differences, the combustion processes undergone by the premixed, spark-ignited combustible mixture in a reciprocating engine and in a rotary engine are essentially the same. In both cases, there are unsteady turbulent flames, set off by the spark(s) and propagating quickly through the combustible mixture. Equations describing such an unsteady motion are presented, and the basic assumptions are discussed. (Author abstract)

43715 **APTIC NO. 67369**

Brogan, John J. and George M. Thur

ADVANCED AUTOMOTIVE POWER SYSTEMS DEVELOPMENT PROGRAM. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 806-824. 3 refs. (Sept. 25-29, Paper 729125.)*

The Advanced Automotive Power Systems (AAPS) program of the Environmental Protection Agency is reviewed. It is responsible for developing alternate automotive power systems for passenger vehicles that demonstrate the 1976 Federal exhaust emission standards. Prototype engine systems are to be demonstrated by 1975. The Rankine system, the Brayton system (gas turbines), and the Stratified Charge system are being actively developed. The AAPS program is described, along with the planning philosophy, technical approaches being used in the development of these systems, the status of development work, and an assessment of the progress and prospects for meeting the 1976 emission standards. The costs, emissions, operating variables, optimum configurations, and performance of these three new engine systems are described. (Author abstract modified)

43716 **APTIC NO. 67366**

Brooks, R. D., S. E. Eckard, R. G. Frank, and K. F. Barber

DESIGN OF RECIPROCATING SINGLE CYLINDER EXPANDERS FOR RANKINE CYCLE ENGINES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 269-278. 3 refs. (Sept. 25-29, Paper 729051.)*

Solid lubricants for automotive steam expanders were evaluated. The mechanical design of a crosshead piston expander and a trunk piston expander are presented. The selection of materials is discussed for the higher temperatures permitted by solid lubricants. Characteristics of the solid lubricants are described for the piston rings and valve stem rings. The test procedure including facility design, method of operating, and test measurement are presented. Finally, results of operation for the crosshead expander with graphite/antimony self-lubricating rings are reported. (Author abstract)

43717 **APTIC NO. 66834**

Cantwell, E. N., E. S. Jacobs, W. G. Kunz, Jr., and V. E. Liberi

CONTROL OF PARTICULATE LEAD EMISSIONS FROM AUTOMOBILES. *Preprint, Society of Automotive Engineers, New York, 18p., 1972. 11 refs. (Presented at the Society of Automotive Engineers National Automobile Engineering Meeting, Detroit, Mich., May 22-26, 1972, Paper 720672.)*

Exhaust particulate lead trapping systems using alumina pellets and cyclone collectors with no moving parts were tested on vehicles for up to 60,000 mi. The devices retained their effectiveness and should last the lifetime of a passenger vehicle without maintenance. The traps reduced the total amount of lead emitted from production vehicles operated on leaded gasoline by 82-91% and also reduced by 64-84% the amount of lead in the air after driving both production and trap-equipped vehicles through a vehicular tunnel. Combining the trapping system with a gaseous emission control system consisting of an exhaust manifold thermal reactor and exhaust gas recirculation resulted in a total lead emission reduction of 85% and a 71% lead level reduction in the tunnel.

43718 **APTIC NO. 67371**

Castor, J. G., R. C. Davis, and B. C. Riddle

PASSENGER CAR GAS TURBINE DESIGN OPTIMIZATION. American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 836-844. 7 refs. (Sept. 25-29, Paper 729127.)

Recommended automobile gas turbine engines are discussed with respect to emissions, performance, life, and cost of ownership. The most promising configuration is a low pressure ratio, single shaft engine with regeneration, either a rotary regenerator or fixed boundary recuperator, and driving the vehicle through an infinitely variable speed ratio transmission. Water injection is considered as a possible means of providing engine power boost when maximum vehicle acceleration is required. Manufacturing and maintenance costs are estimated, and a total cost of ownership for the gas turbine automobile is computed and compared to the same cost for a U. S. six passenger automobile with spark ignition engine. Advance features of the optimum engine-transmission system provide the potential of meeting the performance requirements at a cost of ownership less than that for an automobile with a spark ignition engine. The engine will provide a standing vehicle acceleration response similar to the 1970 automobile with a spark ignition engine, constant speed and average fuel economy better than spark ignition engines, and costs only $400 more than the 1970 automobile without including the additional costs that will be required for the spark ignition engine to meet the 1976 emission standards. The optimum gas turbine power system is estimated to cost less than 1970 spark ignition system by up to $1000. (Author abstract modified)

43719 **APTIC NO. 66725**

Counterman, Paul and Elmar R. Altwicker

INHIBITION OF OXIDATION OF SULFUR DIOXIDE DURING ALKALINE SCRUBBING. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 12(2):43-49, 1972. 5 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 164th, New York, Aug. 28-Sept. 1, 1972.)*

Variables effecting the inhibition of sulfur dioxide oxidation during alkaline scrubbing were studied with an experimental apparatus designed to approximate a stack gas scrubbing system. Benzyl alcohol, phenol, and hydroquinone all inhibited oxidation. A direct relationship existed between phenol concentrations and percent oxidation for a given contract time, and phenol concentrations as low as 0.005% by weight totally prevented the oxidation for a long contact time. Oxidation was reduced to almost zero also by 0.001% hydroquinone at pH values of 9, 7, and 5. The effect of pH on the percent of oxidation for uncatalyzed, uninhibited runs was small over the length of the runs for pH values of 11, 9, and 7.

43720 **APTIC NO. 67375**

Davis, Stephen R., Naeim A. Henein, and Trilochan Singh

EMISSION CHARACTERISTICS OF THE STIRLING AND OTHER ENGINES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill., and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 887-895. 24 refs. (Sept. 25-29, Paper 729134.)*

The emission characteristics of a Stirling engine were studied and compared with other continuous and cyclic combustion engines. The air preheater wall surfaces appeared to play a catalytic role in the partial elimination of some incomplete combustion products as well as nitric oxide and nitrogen dioxide. A comparison between the Stirling and other engines (gasoline, diesel, steam, and gas turbine) showed that it had the lowest carbon monoxide, unburned hydrocarbon, and smoke emissions. Its NO concentration was the lowest at air/fuel ratios greater than 25:1. The use of exhaust gas recirculation reduced NO emissions in all combustion engines, but the degree of effectiveness varied among the engines. Recirculation was not as effective in the Stirling engine as in other types of engines. However, the penalty in fuel consumption was the least in the Stirling engine when compared with other engines. (Author abstract modified)

43721 **APTIC NO. 67378**

Duffy, T. E., J. R. Shekleton, W. A. Compton, and F. P. Hutchins

LOW EMISSION COMBUSTOR/VAPOR GENERATOR FOR AUTOMOTIVE RANKINE CYCLE ENGINES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 927-937. 1 ref. (Sept. 25-29, Paper 729139.)*

A low emission combustor/vapor generator being developed as a prototype for a family of automotive powerplants is discussed. Design philosophy has been placed on low emissions, compactness, low parasitic power, and high response. Major design features include controlled zone combustion, rotating cup fuel atomization, fully modulated fuel and air control systems, and symmetrical air distribution with straight through air flow from the combustor through the vapor generator. Hardware development progress is described. Combustor rig tests with a simulated vapor generator have characterized the emissions of hydrocarbons, carbon monoxide, and nitrogen oxides. A completely integrated system is now in preliminary evaluation tests. This unit includes a fan, air valve, fuel system, combustor, and vapor generator integrated into a compact package 23 in. in diameter and 18 in. long. Its power level is 2.5 times 10 to the 6th power BTU/hr with a steam rate of 1500 lbs/hr of steam at 1000 F and 1000 psig. A turndown ratio of 40 to 1 with full modulation was demonstrated on the combustor. While operating at 1000 psig and 1000 F using the compact fan, air valve combustor, and closely coupled vapor generator, emissions were below EPA s 1976 automotive goals. (Author abstract)

43722 **APTIC NO. 67382**

Dunn, H. Searl and Paul H. Wojciechowski

HIGH-PRESSURE HYDRAULIC HYBRID WITH REGENERATIVE BRAKING. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 898-995. 3 refs. (Sept. 25-29, Paper 729145.)*

An energy storage system having a limited capability is described which is used for removing the burden of acceleration from the vehicle prime mover and for providing a highly efficient regenerative braking system. The immediate goal of the research and development program is to significantly increase energy conversion efficiency in automotive applications. A longer range goal, but one no less important, is the reduction of engine emissions. The advantage of this energy storage system from the emissions standpoint results indirectly from two factors: a prime-mover having less flexibility by comparison with the internal combustion engine could be employed since the burden of vehicle acceleration has been assumed by the stored-energy system; and a prime-mover with a power rating smaller by a factor of two or more than the conventional installation could be used without unacceptably compromising vehicle performance. The combination of these features makes consideration of other powerplants more attractive, since objections to most alternatives fall into the category of too heavy, too bulky, or too slow in response time. (Author abstract)

43723 **APTIC NO. 66742**

Durrant, O. W. and B. C. Krippene

COMBUSTION PRINCIPLES AND PROCESSES FOR NOX CONTROL NATURAL GAS- FIRED UTILITY BOILERS. *Preprint, American Gas Assoc., New York, 20p., 1972. 7 refs. (Presented at the American Gas Association Meeting, Atlanta, Ga., June 6, 1972, Paper PGTP72-26.)*

Combustion principles and processes for the control of nitrogen oxides from natural gas-fired utility boilers are reviewed, with particular emphasis on two-stage combustion, recirculation of boiler outlet flue gas to the burner windbox, and burner design and arrangement. The control methods are based on the theory that anything limiting the peak flame temperature, the time available at peak temperature, or the amount of oxygen present at peak temperature in the active combustion zone will reduce the amount of nitric oxide formation. Recommendations are given for criteria to measure the performance of burners in terms of combustion quality and NOx limitation. The effect of two stage combustion, i.e., the introduction of a portion of the combustion air above the burners, is to extend the flame path into the upper regions of the furnace, with the combustion being completed before leaving the furnace. The success of introducing flue gas recirculation to the burners depends on the blending of the air and gas to achieve a uniform mixture to all burners. The success of such modifications is demonstrated on operating units and includes not only a significant reduction on NOx discharge but also a minimum of unburned combustibles and a stable, continuous combustion process.

43724 **APTIC NO. 66850**

Edwards, H. W.

INTERACTION OF NITRIC OXIDE WITH GRAPHITE. *AIChE Symp. Ser., 68(126):91-101, 1972. 24 refs.*

Kinetic data for reduction of nitric oxide with Graphon, a highly pure graphitized carbon black, were obtained with a flow reactor operated differentially above atmospheric pressure from approximately 1726 to 9310 ppm NO in nitrogen over the temperature range 1027 to 1233 K. A simple and rapid gas chromatographic method was developed for analysis of gas mixtures. Conversion of approximately 79% of NO to products is attainable at the higher temperatures under steady state conditions. Increasing temperature favors formation of carbon monoxide. Concentrations of oxygen of 120 ppm have no detectable effect. The activation energy over this temperature range averages 20.7 kcal/mole. The rate and extent of NO reduction by Graphon are sufficient for consideration for NOx emission control. For an average NO exhaust concentration of 1000 ppm, the corresponding NO emission rate is 3.0 g/mi which would require graphite consumption of 0.6 g/mi. Graphite consumption for 12,000 mi of driving would be 7.2 kg. Problem areas that need further study before emission control devices based on this reaction can be developed are outlined. (Author abstract modified)

43725 **APTIC NO. 67397**

Escher, William J. D.

ON THE HIGHER ENERGY FORM OF WATER (H2O) IN AUTOMOTIVE VEHICLE ADVANCED POWER SYSTEMS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1392-1402. 19 refs. (Sept. 25-29, Paper 729219.)*

The hydrogen-oxygen (stoichiometric) bireactant combination, separately tanked and fed to an advanced-design automotive powerplant is discussed. This higher energy form of water (hydrogen plus oxygen) is compared in terms of onboard vehicle stored energy, volume, mass, and cost with conventional systems employing gasoline and hydrogen internal combustion engines. The higher energy form of water will be produced in abundance in future water-splitting hydrogen production facilities using nuclear or solar energy as envisioned for the post fossil-fuel age hydrogen economy. However, the majority of the H2 energy conversion system studies so far have addressed the hydrogen s reaction with air, not oxygen. Previous studies are reviewed to make the point that not only H2-air-breathing systems, but also the higher energy form of water-nonairbreathing energy conversion systems should be considered for future automotive vehicle propulsion. Particularly, if high-temperature water-fueled power cycles (3000-4000 F) can be developed, a savings in national energy resources of 50% of that needed for present automobiles and future hydrogen-fueled vehicles is technically possible. Additionally, since the sole effluent in the higher energy form of water combustion is the lower energy form of water, this has strikingly positive environmental ramifications. Clearly, a bold new opportunity is presented to the engineering community as it strives for energy conversion systems of the future which must adhere to the precept of benign environmental interaction. (Author abstract)

43726 **APTIC NO. 67381**

Gelb, George H., Baruch Berman, Roselyn S. Lipkis, and Tsih C. Wang

PERFORMANCE ANALYSES OF HEAT ENGINE-BATTERY HYBRID VEHICLES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 977-988. 6 refs. (Sept. 25-29, Paper 729144.)*

The results of analytical studies of the electrical and electronic components and power train behavior of a series and a parallel configured heat engine/battery hybrid family car are presented. After a careful review of the power and torque demands of a full-sized, 4000-pound family car, the major power train elements including rotating machinery, power processors, batteries, and engine/battery load sharing techniques were selected. Each element was characterized by appropriate parameters such as machine efficiency as a function of torque and speed or power processor efficiency as a function of current and voltage. The performance of each component was evaluated at a large number of vehicle acceleration/deceleration velocity points. This data, coupled with driving event probability distributions allowed an assessment of average component and power system performance on a realistic urban highway driving route. Data showing the variation of series and parallel systems behavior with charging engine power, battery characteristics, and gearing are presented. Machinery and power processor cooling and rating implications are shown. Wherever possible, the analytical data is compared with experimental data. Fuel consumption and battery usage effects are drawn. The series and parallel heat engine/battery hybrid vehicle systems were modeled on a digital computer. The simulated models were run over a driving cycle typical of urban driving. The parallel system had an overall efficiency as high as 77% when it used moderately advanced lead-acid batteries and gearing. The series system maximum efficiency was near 55%. A variable gear ratio between the motor and rear wheels was important to overall system efficiency; the effect was more pronounced for the parallel system. Regenerative braking improved the system efficiency by approximately 10%, while the effect of gearing was nearly proportional to the gear trains efficiencies. Battery impedance had secondary impact on system efficiency. (Author abstract modified)

43727 **APTIC NO. 67388**

Graff, Robert A., Samuel I. Dobner, and Arthur M. Squires

CONVERSION OF COAL TO CLEAN POWER. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1152-1158. 9 refs. (Sept. 25-29, Paper 72972.)*

Inadequate supplies of low-sulfur fuels and disappointing progress in the development of stack gas cleaning processes have led to new interest in combined-cycle power plants. Combination of gas and steam turbines can provide power at an efficiency markedly higher than that attainable from the steam cycle alone. Clean gas required by gas turbines can advantageously be obtained from coal gasification followed by dust and sulfur removal. Advantages of low-sulfur emissions and heat rejection to cooling water accrue in the combined cycle. In addition, there is reason to believe that the firing of turbines with lean fuel will result in a reduction of nitrogen oxide emissions by roughly two orders of magnitude. A fast-fluid agglomerating bed gasifier concept is discussed and compared with the state-of-the-art Lurgi gasifier. Recent kinetic data on the reaction of hydrogen sulfide with calcined dolomite have confirmed that this solid is a strong candidate for desulfurization of lean fuel gas. A panel bed filter charged with calcined dolomite can be used to remove dust and sulfur simultaneously. Regeneration of the desulfurizing agent and the production of elemental sulfur are particularly advantageous. (Author abstract)

43728 **APTIC NO. 67392**

Gregory, Derek P. and Jaroslav Wurm

PRODUCTION AND DISTRIBUTION OF HYDROGEN AS A UNIVERSAL FUEL. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1329-1334. 10 refs. (Sept. 25-29, Paper 729208.)*

As fossil fuel becomes depleted, its cost will increase until alternative energy sources become competitive. The cost of providing an energy supply is strongly influenced by the cost of delivering or transmitting the energy from its source to its point of use. Modern technology leans toward electrical energy as a means of supplying increasing energy needs and toward nuclear-electric power as an ultimate substitute for fossil fuel. Electric power is a most expensive energy form to transmit and deliver and cannot readily be stored. A synthetic chemical fuel could be storable and cheaper to transmit. Hydrogen appears to be the cleanest and simplest synthetic fuel, but its use would present some new technological problems. It could do all the jobs done by natural gas and more. Its universal availability would give rise to new technological opportunities. Transition to a hydrogen economy would have to be a well-planned, nationwide operation. Since H2 can easily be made from conventional fossil fuels, it could bridge the gap between the fossil and nuclear ages by a well thought-out conversion program. (Author abstract modified)

43729 **APTIC NO. 67377**

Hazard, Herbert R. and F. Peter Hutchins

DEVELOPMENT OF A LOW-EMISSION COMBUSTOR FOR AN AUTOMOTIVE RANKINE-CYCLE ENGINE. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 938-947. 7 refs. (Sept. 25-29, Paper 729140.)*

The development of a low-emission burner for an automotive Rankine-cycle engine is described, and emission characteristics of four basic types of burners firing kerosene-type fuels at firing rates from 1 to 110 lbs/hr are presented. Emission levels for nitrogen oxides were highly dependent on primary-zone temperature and air-fuel ratio, but independent of firing rate and residence time over a 10:1 ratio. This independence of residence time was in marked contrast with results from simple burners used in fundamental research. The burner with the lowest emission level used a cooled, rich primary zone and a lean secondary zone. Use of exhaust gas recirculation reduced NOx emission significantly for the best burner. Air atomizers of conventional design did not provide good fuel atomization and dispersion over the required turndown ratio of 100:1, and an acoustic-type nozzle of unique design proved necessary to meet this requirement. Air atomization also had a significant effect on combustor geometry, in that it provided sufficient turbulence at the lowest firing rates that variable-geometry design proved unnecessary as a means of promoting turbulence. It was suspected that the highly turbulent zone of high combustion intensity generated by injection of atomizing air with fuel was the principal source of much of the nitric oxide generated in the combustor. Even with a rich primary zone, this region provided a small zone of high oxygen concentration and high temperature suitable for NO formation. In general, the Rankine cycle met the 1975 Federal emission standards for carbon monoxide, hydrocarbons, and smoke, but standards for NOx were difficult to meet. (Author abstract modified)

43730 **APTIC NO. 67379**

Hoagland, L. C., W. D. Syniuta, J. Gerstmann, and W. Zeber

DESIGN FEATURES OF LOW EXHAUST EMISSION AUTOMOTIVE STEAM POWERPLANT. *American Chemical Society, Washington, D. C., American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 940-959. 1 ref. (Sept. 25-29, Paper 729141.)*

A closed cycle steam powerplant was developed and tested. The Rankine cycle system employs a continuous combustion burner fed with combustion air at near atmospheric pressure and temperature. Because the combustion is continuous, it may be carried out under carefully controlled conditions, and thus produces extremely low levels of carbon monoxide, nitrogen oxides, and hydrocarbons. The Rankine reciprocating steam engine can deliver exhaust emissions well below the 1975/1976 Federal standards while providing the power and performance required in the modern American passenger car within the space envelope occupied by the current powerplant. The steam engine can provide fuel economy comparable to that of the gasoline spark ignition engine. The steam engine design and performance are discussed. (Author conclusions modified)

43731 **APTIC NO. 67386**

Jakubowski, M.

FLYWHEEL ENERGY BUFFER. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1141-1145. 4 refs. (Sept. 25-29, Paper 729170.)*

The feasibility of a flywheel energy buffer is discussed. Preliminary indications show that the flywheel unit can be used as an energy storage device in a standby power source. Recent developments in flywheel technology make it an attractive alternative to battery systems in automobiles. A flywheel energy storage unit can be designed and built for a 5-year, maintenance- free life at a low unit cost of $250-300/unit and high reliability level of 0.998. Three types of flywheels discussed are constant-stress solid disk, wire-(or fiber-) wound rim, and uniform radial wire or fiber. (Author abstract modified)

43732 **APTIC NO. 66852**

Jonke, A. A., G. J. Vogel, E. L. Carls, D. Ramaswami, L. Anastasia, R. Jarry, and M. Haas

POLLUTION CONTROL CAPABILITIES OF FLUIDIZED-BED COMBUSTION. *AIChE Symp. Ser., 68(126):241-251, 1972. 1 ref.*

The combustion of fossil fuels in a fluidized bed of limestone additive was investigated. The effect of operating variables was determined on the reaction of pollutant sulfur dioxide and nitrogen oxides with the additive, and the combustion efficiency was obtained. When coal burned with excess air and coarse limestone, the operating variables which had significant effects on sulfur retention were the calcium/sulfur mole ratio in the feed streams, the fluidized-bed temperature, and the superficial gas velocity. The experimental results of burning coal with a deficiency of air and coarse limestone include data on the concentrations of SO2, hydrogen sulfide, and carbon monoxide in the off gases at various air feed rates and bed temperatures. When oil was combusted, the nitric oxide levels in the flue gas ranged from 110 to 150 ppm for the experiments with 3% oxygen in the flue gas, as compared with the 400 to 800 ppm range observed when coal was burned. Fuel was also burned in a bed of inert solids to which elutriable small particle limestone was added to control SO2 emission. The mechanism of the sulfur capture was studied. (Author summary modified)

43733 **APTIC NO. 67368**

Killackey, J. J., D. W. Graumann, and W. Zeber

PERFORATED PLATE-FIN HEAT TRANSFER SURFACES FOR RANKINE CYCLE AUTOMOBILE CONDENSERS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 358-367. 5 refs. (Sept. 25-29, Paper 729063.)*

The heat transfer and flow friction characteristics of 13 perforated plain rectangular plate-fin surfaces are presented. The fin spacing, height, and thickness of all surfaces were identical so that the effects of perforation size and spacing could be determined. Both round and slotted perforations were tested with open area ratios ranging from 6 to 33%. Use of the optimum perforated fin in a Rankine cycle automobile condenser resulted in significant size reductions over units employing the best conventional automotive heat transfer surfaces. The perforated fin experimental performance data obtained showed that the Environmental Protection Agency condenser design goals could be substantially met. The best perforated fin condenser design met the EPA volume goal and was within 6% of the face area goal. By comparison, the best current automotive fin yields a condenser which exceeds the EPA volume and area goals by 47 and 18%, respectively. (Author abstract modified)

43734 **APTIC NO. 67383**

Menchen, W. R., J. P. Donnelly, and K. M. Campe

THE RESOURCE, ENVIRONMENTAL, AND SOCIOECONOMIC IMPACTS OF A TRANSITION FROM THE ICE TO VARIOUS ADVANCED AUTOMOTIVE PROPULSION SYSTEMS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1003-1012. 11 refs. (Sept. 25-29, Paper 729147.)*

A transition from the current internal combustion engine to one or more advanced, low-polluting propulsion systems will probably occur in the period up to the year 2000. A study of candidate advanced propulsion systems and a baseline internal combustion engine revealed that a substantial modeling effort was necessary to evaluate the impacts of any proposed transition. A first generation model incorporating five interrelated areas was formulated and is now in use. A computer program handles the large amounts of data required for the model to function. The model is capable of simultaneous analysis of several impact sectors over a 30-year-span for six separate propulsion systems. Illustrative results are presented for two transportation strategies and compared to the 1971 internal combustion engine baseline case. The impact areas covered are materials, energy, and air emissions. Societal and economic results are not presented in this paper, but will be evaluated as part of the overall study. The two transportation strategies discussed are an advanced internal combustion propulsion system which will almost meet the 1976 clean air standards and a Rankine system assumed to be available in limited quantities starting in 1977. (Author abstract modified)

43735 **APTIC NO. 66774**

Michaelis, Theodore B.

CONTROL OF EMISSIONS TO THE ATMOSPHERE. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 361-373. (April 20-21.)*

The control of emissions to the atmosphere is discussed with emphasis on incineration and adsorption. Emissions of solvents to the atmosphere can also be prevented by absorption and condensation. Only incineration and adsorption produce air streams sufficiently purified to meet pollution control requirements. A direct fired afterburner incinerator is used to handling air streams containing low concentrations of highly odorous material, or any concentrations of materials which would have no value, even if recovered. The installed costs range from $5 to $10/SCFM of contaminated air. Maintenance costs for a catalytic unit are higher and the use of the unit is not practical when the incoming contaminated air contains chlorides, silicones, or other elements which will poison the catalyst rapidly. Adsorption is the name for the phenomenon in which the molecules of a fluid contact and adhere to the surface of a solid. The choice of carbon, operating cycle time, the size of the adsorbers, the C bed depth, and the materials of construction require an experienced designer to create an optimum system. The cost can vary from $15/SCFM to $40/SCFM. The first cost of an adsorption system is higher than that of an incineration system, but the value of the recovered solvents will frequently pay for the cost of the system in a reasonable time.

43736 **APTIC NO. 67374**

Michels, A. P. J.

C.V.S. TEST SIMULATION OF A 128-KW STIRLING PASSENGER CAR ENGINE. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 875-885. 2 refs. (Sept. 25-29, Paper 729133.)*

A 128-kW Stirling engine was designed for a 4600-pound passenger car. A Ford Torino was used, equipped with all the safety devices which will presumably be required for 1976. The engine shaft should satisfy the envisaged requirements of safety and driveability. The fuel consumption as a function of time was calculated for 1371 sec of the Federal constant volume sampling cycle, full account being taken of the characteristics of the gear box, torque converter, and auxiliaries. The calculated rate of fuel flow was used for the determination of the emission properties of the continuous heating system of the engine. The complete heating system was constructed, and a constant preheated air temperature of 650 C was employed. The Federal emission limits of 0.41 g/mi hydrocarbons and 3.4 g/mi carbon monoxide were easily attained. Even the limit of 0.4 g/mi nitrogen oxides could be met, provided that exhaust gas recirculation was applied. The cold starts did not cause problems as far as the HC and CO emissions were concerned, while the influence on the NOx emission was minimal. (Author abstract modified)

43737 **APTIC NO. 67367**

Miller, D. R., Q. E. Thompson, H. R. Null, and K. F. Barber

WORKING FLUIDS FOR AUTOMOTIVE RANKINE ENGINES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 315-326. 29 refs. (Sept. 25-29, Paper 729056.)*

The principal results of a search for optimum working fluids that can be used in Rankine engines with reciprocating or turbine type expanders are presented. The search included a blend of experiment, theory, and prediction and was guided by a stringent set of fluid criteria carefully stated to assure ultimate acceptance and superiority of the fluids for the applications considered. These criteria are discussed along with the methods and procedures by which they were applied in the screening process. The fluid search involved single compounds and mixtures of several chemical species in order to exploit combinations of properties unattainable otherwise. Water, which by itself does not qualify under the criteria, was regarded as a preferred mixture component because of its recognized virtues. Over a hundred organic compounds entered into the selection process of the search. (Author abstract)

43738 **APTIC NO. 67376**

Morgan, Dean T., Edward Doyle, and Peter Hutchins

LOW EMISSION RANKINE CYCLE ENGINE WITH ORGANIC-BASED WORKING FLUID AND RECIPROCATING EXPANDER FOR AUTOMOBILES. *American Chemical Society, Washington, D. C.; American Inst of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 913-926. (Sept. 25-29, Paper 729138.)*

A low-emission Rankine cycle propulsion system for automobiles based on use of an organic-based working fluid with reciprocating expander is described. The predicted performance and fuel consumption of this engine in a reference Ford Galaxie are presented. The system is designed to provide performance approximately equivalent to use of a 351 cu in. displacement internal combustion engine in the reference car. Acceleration performance, fuel consumption, emission levels measured over the Federal driving cycle, and engine design are noted. The g/mi emission levels were below the 1976 Federal standards by a factor of 1.4 for nitrogen oxides, 15.4 for carbon monoxide, and 2.9 for hydrocarbons. Exhaust gas recirculation use will result in even lower NOx emission rates. The system can be completely packaged in the engine compartment of a 1972 Ford Galaxie with only minor internal sheet metal modifications in the engine compartment required. The customer-average fuel consumption with the 1972 Ford Galaxie is predicted to be 10 mi/gal.

43739 **APTIC NO. 67395**

Murray, Richard G., Roger J. Schoeppel, and Charles L. Gray

THE HYDROGEN ENGINE IN PERSPECTIVE. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1375-1381. 12 refs. (Sept. 25-29, Paper 729216.)*

The latest performance and emission characteristics of an air breathing, hydrogen-burning engine are reported, and the engine is discussed with regard to the future total energy picture. Since the production of energy and the creation of air pollution are interrelated aspects of the same problem, a discussion of one must give consideration to the effects of the other. Early data indicated that a hydrogen-fueled engine should yield torque, power, and efficiency values comparable to an equivalent gasoline-fueled spark ignition engine. The performance outlook of this first engine was so optimistic that the Environmental Protection Agency funded an effort to study further design improvements and to test emission characteristics. Data from recent tests indicated that it should be possible with today s technology to fabricate a reliable engine to power an automobile or truck. It is expected that this vehicle would have adequate range, normal size, and would fall within a complexity and reliability range similar to today s gasoline counterpart. In addition, it would emit no measurable hydrocarbons, organic, or sulfur compounds. Oxides of nitrogen emissions below 1976 emission standards would be expected. (Author abstract modified)

43740 **APTIC NO. 66777**

Rao, K. S., T. Ariman, K. T. Yang, and R. L. Hosbein

COLLECTION OF DUST BY FABRIC FILTRATION IN AN ELECTROSTATIC FIELD. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 555-571. 17 refs. (April 20-21.)*

The deposition of charged dust particles on circular cylindrical fibers perpendicular to the air stream in a homogeneous electrical field was investigated. A simple theoretical model of a filter was developed and consists of evenly arranged layers of equidistant parallel cylinders of infinite length normal to the flow direction. The distance between successive fibers in a filter layer is included in the formulation. Assuming potential flow, the velocity and electrostatic potentials are corrected by the method of images when the distance between the cylinders is small. Neglecting polarization, image, gravity, and inertia forces, the critical trajectories of the particles are calculated by numerically solving the differential equation for the particle trajectories. The calculated values of the deposition coefficient are compared with the results of previous investigations. The influence of various dimensionless parameters on deposition is discussed. (Author abstract modified)

43741 **APTIC NO. 67370**

Rossbach, R. J., A. W. Schnacke, and G. C. Wesling

AUTOMOBILE GAS TURBINE ENGINE CYCLE MODIFICATIONS CONDUCIVE TO LOW NOX COMBUSTOR DEVELOPMENT. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 825-835. 7 refs. (Sept. 25-29, Paper 729126.)*

The requirements of the 1970 Clean Air Act Amendments for exhaust emission standards for new cars for unburned hydrocarbons and carbon monoxide in 1975 and for nitrogen oxides in 1976 may be met potentially by several engines. However, each engine type must be improved to meet the standards. In the gas turbine, a regenerator makes the engine fuel economy competitive with the present reciprocating engine. However, the high combustor inlet temperature caused by the regenerator makes it difficult to meet the NOx standard. Two engine cycle modifications designed to alleviate this problem are discussed, as well as the concomitant penalties in fuel economy. The regenerated, single shaft engine with variable primary combustor air regenerator bypass and with variable stators on the compressor and turbine is recommended for development as an advanced automobile gas turbine because the low NOx combustor has a higher potential for meeting the 1976 NOx emission standard than the 1000 F inlet combustor. Also, the PD-1 engine permits considerable design freedom in developing the low NOx combustor by virtue of the location of the combustor in front of the engine and by virtue of the large volume available for the combustor. The PD-1 engine has no greater net cost of ownership than the PD-2 engine. (Author abstract modified)

43742 **APTIC NO. 67396**

Sorensen, Harold

THE BOSTON REFORMED FUEL CAR--A LOW POLLUTING GASOLINE FUEL SYSTEM FOR INTERNAL COMBUSTION ENGINES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1388-1391. (Sept. 25-29, Paper 729218.)*

A compact system was devised to reform unleaded gasoline into hydrogen and carbon dioxide, a nonpolluting fuel. The system was sized and packaged for installation in an automobile. The significant system and component design considerations are presented, and the hardware is described. The exhaust gases produced are water vapor and carbon dioxide, neither of which is considered to be a pollutant. In dynamometer tests, the engine power and response were good and the exhaust emissions were within the 1976 Federal emission standards. (Author abstract modified)

43743 **APTIC NO. 66736**

Tayts, Y. M. and I. A. Andreyev

REDUCING SULFUR CONTENT IN THE COALS OF THE MOSCOW BASIN. *(O Snizhenii soderzhaniya sery v uglyakh podmoskovnogo basseyna). Text in Russian. Khim. Tverd. Topl., no. 5:44-47, Sept.-Oct. 1972. 3 refs.*

Experiments concerning the removal of sulfur from the high-sulfur soft coal from the Moscow Basin are described. The coal, ground to 1-0.5 mm, was first heated to 200-1000 C under exclusion of air, after which the resulting semicoke was subjected to magnetic separation at a magnetic field intensity of 6000 or 9000 Oersted. Both the proportion of the magnetic fraction containing sulfur, and its sulfur content increased with the temperature and the magnetic field intensity. A temperature of 600 C was best. Relative to the initial material, the sulfur content in the nonmagnetic fraction, amounting to about 20% of the total, was reduced by 43-63%. The usual high-speed or high-frequency heat-up was most suitable for desulfurization.

43744 **APTIC NO. 66778**

Theodore, Louis and Anthony J. Buonicore

A STUDY OF INDUSTRIAL AIR QUALITY CONTROL METHODS FOR PARTICULATES. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 573-593. 16 refs. (April 20-21.)*

Modeling and simulation techniques were used to predict the behavior of centrifugal separators, electrostatic precipitators, filters, and venturi scrubbers. The describing equations were developed from fundamental principles and contain several variables not previously treated in the literature. They include the effects on particle collection efficiency of particle size distribution, particle mass flow rate profile, and external force variations. A statistical technique using random numbers is presented to deal with some of the more significant and complex system variables. In centrifugal separators and electrostatic precipitators the Monte Carlo technique provides relatively simple treatment for some of the more significant and complex system variables. The development for treatment of filters and venturi scrubbers makes use of Happel's free surface model. (Author abstract modified)

43745 **APTIC NO. 67384**

Ward, Edward J., James O. Spriggs, and Frederick M. Varney

NEW PRIME MOVERS FOR GROUND TRANSPORTATION--LOW POLLUTION, LOW FUEL CONSUMPTION. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1013-1021. 17 refs. (Sept. 25-29, Paper 729148.)*

The needs of the Federal Railroad Administration for self-contained prime movers is described in the context of the now drastically more stringent air, noise, and thermal pollution limits and minimal fuel consumption. There are a number of engine types that will not only meet those needs, but also hold great promise of further innovative development for tracked ground transportation, a wide range of other mobile uses, and fixed installations as well. The engines discussed include Stirling, closed cycle Brayton, Ericsson cycle, semi-closed cycle, and polytropic cycle engines. (Author abstract modified)

43746 **APTIC NO. 67372**

White, David J., P. B. Roberts, and W. A. Compton

A JET INDUCED CIRCULATION COMBUSTOR WITH LOW NOX EMISSIONS FOR AN AUTOMOTIVE GAS TURBINE ENGINE. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 845-851. 4 refs. (Sept. 25-29, Paper 729130.)*

A Jet Induced Circulation (JIC) combustor is described which has demonstrated potential for meeting the 1975-1976 Federal emission standards for light duty vehicles while operating at typical regenerative engine conditions. The organization and implementation of the program which produced this innovative concept in combustor design is also outlined, together with some of the alternate approaches investigated. The two designs which gave very promising results were the Vortex Induced Circulation (VIC) combustor and the JIC combustor. The latter demonstrated better performance with liquid fuels than the VIC system, and its design generally allowed greater flexibility in terms of fuel-air ratio control within the combustor. (Author abstract modified)

43747 **APTIC NO. 67385**

Wiss, John W., Walter Bryzik, George E. Cheklich, and Floyd B. Lux

CONTROLLING DIESEL EXHAUST SMOKE WITH COMBUSTION CHAMBER SURFACE TREATMENT. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1073-1078. 7 refs. (Sept. 25-29, Paper 729159.)*

Recent interest in environmental improvement and continuing requirements for reduction in military vehicle visibility have stimulated efforts to abate diesel engine smoke. Black smoke resulting from pyrolysis of fuel occurs when the burning fuel droplet has insufficient oxygen or inadequate temperature to complete the combustion of carbon. One method of improving temperature conditions through the use of infrared reflective combustion chamber surfaces is discussed. Results indicate that the approach offers promise of significant improvements in diesel smoke abatement. The experimental techniques in the still-developing area of smoke measurement show that a rather high degree of sensitivity and reproducibility can be attained with good equipment and test personnel. The best smoke-abatement performances of reflectively-coated combustion chambers require an appropriate injection timing retardation when compared with a conventional combustion chamber. With proper equipment and careful workmanship, it is possible to make precise, sensitive, and reproducible measurements of black smoke from a diesel engine exhaust under both static and dynamic conditions. (Author abstract modified)

43748 **APTIC NO. 67393**

Witcofski, Robert D.

POTENTIALS AND PROBLEMS OF HYDROGEN FUELED SUPERSONIC AND HYPERSONIC AIRCRAFT. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1349-1354. 19 refs. (Sept. 25-29, Paper 729211.)*

Current and projected air passenger travel trends, the growing concern over environmental protection, and the potential depletion of our fossil fuel reserves, when combined with results of recent aeronautical research programs, leads to the consideration of liquid hydrogen fuel for transport aircraft. The use of liquid H2 gives superior range and/or payload capability as compared to JP fueled aircraft, at speeds from Mach 3 to 8. Supersonic combustion ramjet engines, having low cooling requirements, make available a large portion of the heat-sink capacity of liquid H2 fuel for active cooling of the entire airframe, opening the door to the use of conventional aircraft materials and construction experience to speeds as high as Mach 8 or 10. The characteristics of hydrogen-fueled aircraft engines from supersonic to hypersonic speeds are discussed. Structural aspects of both hot and actively cooled aircraft are discussed, including the problem of insulating the H2 fuel. The effects on aircraft performance of the strong interaction between the propulsive, structural, and aerodynamic aspects of hypersonic aircraft are considered. The implications of the possible use of slush hydrogen are also covered. Environmental and economic aspects are considered, and operational aspects needing further attention are also discussed. (Author abstract)

43749 **APTIC NO. 67373**

Wright, Edward S.

AUTOMOBILE GAS TURBINE ENGINE OPTIMIZATION STUDY. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 852-864. 30 refs. (Sept. 25-29, Paper 729131.)*

A gas turbine engine optimization study was conducted to identify the optimum turbine for standard-sized passenger cars capable of meeting emission standards and of being demonstrated by 1975. Following a comprehensive review of the applicable cycles, three engines were selected for detailed optimization. There were regenerated, recuperated, and simple-cycle versions of single-shaft engines based on all-radial single-stage compressors and turbines of advanced performance. The design features of each engine are presented and discussed. Comparative emissions, automobile initial price estimates, fuel economy, size and weight, ownership and operating cost, technological risk, and several miscellaneous factors are discussed. As a result of this evaluation, the simple-cycle engine was selected as the optimum engine to meet future low-emission automobile requirements. (Author abstract modified)

1971

43750 **APTIC NO. 67288**

Chamberlain, R. E.

IMPROVED RECOVERY FURNACE OPERATION THROUGH AUTOMATIC COMBUSTION CONTROL. *Instrument Society of America, Pittsburgh, Pa., Instr. Soc. Am. Annu. Conf. 26th, Chicago, Ill., 1971, 14p. 9 refs. (Oct. 4-6, Paper 71-542.)*

The employment of improved recovery furnace operation to reduce odor and particulate emissions is discussed, with particular emphasis on automatic combustion control. Variations in furnace temperature with time and with position around the char bed at a given time contribute to increased odor and particulate emissions. Brightness measurement can assist in reducing the variation of temperature around the char bed, while automatic control of burning rate can reduce the variation in temperature with time. Control of burning rate can be obtained through control of the air supply temperature and air distribution. Best operation is provided at the lowest liquor temperature which maintains effective combustion in the lower furnace with a margin to compensate for input disturbances. Automatic control of burning allows the margin to be reduced. Flow measurements can be provided to identify the liquor composition, the true input solids rate, carryover recirculation, and to monitor the furnace solids balance. Difficulties of liquor solids measurement to the furnace require that the monitoring of recirculation be done on a measured ratio, rather than on an absolute basis.

1970

43751 **APTIC NO. 67027**

Gompf, Henry L.

RETRO-FIT EMISSION CONTROL DEVICES FOR PRE-1968 VEHICLES. *National Air Pollution Control Administration, Ann Arbor, Mich., Div. of Motor Vehicle Research and Development, Rept. APTD-1439, 12p., July 1970.*

NTIS: PB 218 841

Retro-fit emission control devices developed by General Motors and Ford for pre-1968 vehicles were evaluated. Three automobiles were tested using Iodolene 30 fuel. The GM device reduced hydrocarbons, carbon monoxide, and nitric oxide by 54%, 24%, and 29% respectively on the 1968 FTP (Federal Test Procedure) and 35%, 14%, and 16% respectively on the 1972 FTP. The Ford device reduced hydrocarbons, CO, and NO by 66%, 39%, and 57% on the 1968 FTP and 58%, 27%, and 16% on the 1972 FTP.

43752 **APTIC NO. 67305**

Kreith, Frank

AIR POLLUTION CONTROL OF PARTICULATE MATTER. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 425-458, 1972. 29 refs. (Aug. 3-15.)*

The sources and control of particulate air pollution are discussed. Particulates between 1-10 micron are the most numerous and include industrial dust and fly ash. Particles between 0.1 and 1.0 micron contain products of condensation, combustion, aerosols formed by photochemical reactions in the air, and ammonium sulfate. Devices that collect particles from industrial air streams include: gravity settling chamber, cyclones, scrubbers, filters, and electrostatic precipitators. The estimated cost in capital investment and operation for particulate control at the 80%, 90%, and maximum possible control level is tabulated for 85 metropolitan areas for the fiscal years 1971 to 1975.

1950

43753 **APTIC NO. 67364**

Brisse, A. H.

SONIC AGGLOMERATION OF FUME IN FERROMANGANESE BLAST FURNACE GAS. *Ind. Heating, 1950:1966-1972, Nov. 1950. 1 ref.*

Qualitative laboratory investigations were made on sonic agglomeration of fume particles in ferromanganese blast furnace gas. The sound chamber consisted of a 4-inch inside diameter iron tube, 4 ft long, insulated throughout its length. A horn-type loudspeaker excited by a variable frequency oscillator and driven by a power amplifier was the sound source. A crystal microphone was used to measure sound pressures within the chamber. The gas, after treatment in the sonic chamber, was passed through a 0.75-in. Aerotec tube and then through a small filter bag to remove any residual dust, with the trapped dust indicating the efficiency of the process. Sound frequencies between 1400 and 2000 Hz appeared quite effective for agglomeration of the ferromanganese dust, with the critical sound pressure value being approximately 14,000 dynes/sq cm. Minimum retention time of the gas in the sound chamber for appreciable agglomeration was well over 3 sec.

MEASUREMENT METHODS

1974

43754 **APTIC NO. 67251**

Andersen, Ariel A.

SAMPLER OF AIR-BORNE PARTICLES. *(2000, Inc., Salt Lake City, Utah) U. S. Pat. 3,795,135. 5p., March 5, 1974. 9 refs. (Appl. Nov. 7, 1972, 3 claims).*

An airborne particulate sampler which automatically classifies particles according to aerodynamic size for subsequent visual inspection and analysis is described in which the collecting plates also act as jet producing means so that the invention can be used in various sampler models. The device consists of an elongated container with inlet and outlet ends and several removable transverse perforated plates. The particulate-laden gas passes through small holes in the plates at progressively increasing velocities from inlet to outlet, with the particles being deposited in progressively decreasing size on the plates in a direction away from the inlet. A vacuum pump attachment is provided for using a pump to draw air or other gases through the device. The holes on adjacent plates are out of alignment with each other, thus causing the gas to change direction as it passes through one plate to the next at approximately a 90 degree turn. A removable spacer is provided to prevent the gas from reversing flow in a 180 degree direction.

43755 **APTIC NO. 66691**

Angerer, J. and A. Haag

THE ANALYSIS OF THE COMPONENTS IN THE ULTRA TRACE RANGE. STUDIES ON THE PRACTICAL APPLICATION OF THE THERMOGRADIENT TUBE GAS CHROMATOGRAPH - MASS SPECTROMETER COMBINATION. *(Zur Luftanalyse im Ultraspurenbereich - Untersuchungen zur praktischen Verwendung der Kombination Thermogradientrohr- Gaschromatograph-Massenspektrometer). Text in German. Z. Klin. Chem. Biochem. (Munich), 12(6):321-326, 1974. 10 refs.*

The combination of the thermogradient tube, gas-chromatograph and mass spectrometer in the detection and analysis of ultra trace components in air was studied. Sampling and elution were reproducible with the thermogradient tube. The gas-chromatographic presentation occurring in the thermogradient tube was avoidable by elution and uptake in opposite directions. The specificity and selectivity of the method can be increased by variation of the elution conditions, by the phase selection in the thermogradient tube, and by the use of selective detectors, such as the mass spectrometer. A further increase in specificity and a very marked reduction of the detection limit were achieved by using mass fragmentography as a detection system. It was thus possible to determine specifically the smallest concentrations in a multicomponent system, e.g., air, of such substances as methane, methanol, dichloromethane, methyl chloride, freon, ethane, ethanol, ethylene, acetone, trichloroethylene, tetrachloroethylene, propane, butane, butene, isobutanol, diethyl ether, pentane, pentene, pentadiene, hexane, benzene, trichlorobenzene, heptane, toluene, octane, xylene, trimethylbenzene, and methylethylbenzene.

43756 **APTIC NO. 66884**

Asai, K. and T. Igarashi

DETECTION OF OZONE BY DIFFERENTIAL ABSORPTION USING CO2 LASER. *Proc. Int. Laser Radar*

Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 101n102. 4 refs. (Sept. 3-6, Paper VI-9.)

A new laser detection method for ozone is described which uses a differential absorption technique with a carbon dioxide laser. The method can also be used to measure ethylene and ammonia. It is much simpler than methods using infrared diode lasers and infrared parametric oscillators.

43757 **APTIC NO. 66920**

Barna, G. G. and R. J. Jasinski

SEMIQUANTITATIVE POTENTIOMETRIC METHOD FOR DIRECT MEASUREMENT OF NITROGEN DIOXIDE IN AIR. *Anal. Chem., 46(12):1834-1837, Oct. 1974. 6 refs.*

A semiquantitative potentiometric method for the direct measurement of nitrogen dioxide in air is described. The method uses an activated iron-chalcogenide glass electrode in a system that avoids the complication of a preconcentration step while still maintaining high sensitivity. The procedure achieves selectivity directly via the nature of the chemical interaction between the gas and the sensor material, while maintaining the advantage of simplicity in measurement. The necessary liquid-solid interface is obtained via an inverted cell configuration. In the potentiometric mode of operation, the measured variable is the open-circuit voltage between the sensor and reference electrodes, with the voltage being determined by the potentials of the two electrodes. The chalcogenide glass material is the basis of the electrode sensitive to ferric ions; and with proper pretreatment, this material also gives a positive potential shift when equilibrated with NO2 in the presence of air, while being insensitive to nitric oxide, sulfur dioxide, carbon monoxide, and methane.

43758 **APTIC NO. 66599**

Baum, F. and H. Schwegler

CONSIDERATIONS ON THE FEASIBILITY OF EMISSION MEASUREMENTS WITHIN THE FRAMEWORK OF LEGALLY REQUIRED INSPECTIONS. *(Ueberlegungen zur Durchfuehrbarkeit von Emissionsmessungen im Rahmen gesetzlich angeordneter Ueberpruefungen). Text in German. Gesundh.-Ingr., 95(8):630-632, Aug. 1974. 14 refs.*

A proposal concerning the organization of recurrent emission measurements required for industrial plants whose operation is subject to authorization in view of harmful emissions is presented. The abandonment of recurrent emission measurement by the competent authorities or assigned laboratories is due to a lack of personnel which can be eliminated by the setup of an emission testing system composed of a center, central laboratories, and testing laboratories. The center would have the task of developing simple routine testing methods for use by the testing laboratories. The measurements would be evaluated by the central laboratories, while complicated measurements would be performed by the testing center. Measurement values in excess of standard levels would be checked by repeated sampling.

43759 **APTIC NO. 66915**

Bay, H. W., K. F. Blurton, J. M. Sedlak, and A. M. Valentine

ELECTROCHEMICAL TECHNIQUE FOR THE MEASUREMENT OF CARBON MONOXIDE. *Anal. Chem., 46(12):1837-1839, Oct. 1974. 11 refs.*

An electrochemical technique for the measurement of carbon monoxide based on the electrochemical oxidation of CO at a Teflon-bonded diffusion electrode is considered in terms of a theoretical analysis of the mass transfer and electrochemical processes occurring in the electrochemical sensor as well as experimental data justifying the equations developed. The overall mass transfer-electrochemical reaction process in the sensor is given by an equation containing terms for convective transport of CO in the x-direction and for unsteady-state mass transfer of CO through the porous electrode and subsequent electrochemical oxidation. The overall process in the sensor involves, first, the transport of CO through the hydrodynamic boundary layer at the gas/solid interface and, second, a series of diffusion, adsorption, and oxidation steps within the electrode system. The first step is dependent on gas flow rate, whereas the latter steps are not. Experimentally observed behavior of the electrochemical sensor is in agreement with the theoretical predictions; and the rapid signal response and decay times, as well as the large signal per ppm of CO, demonstrate that ambient CO concentrations can be measured with the technique.

43760 **APTIC NO. 66606**

Birkle, M.

SETUP OF AN AUTOMATIC AIR POLLUTION MONITORING NETWORK. *(Aufbau eines automatischen Immissionsmessnetzes). Text in German. Siemens. Z., 48(8):525-532, 1974. 25 refs.*

The structure and functioning of automatic air pollution monitoring networks are described. Automatic monitoring networks are usually composed of measuring units which constitute the basic units of the system and which may include up to four pollutant analyzers complete with the corresponding calibration units, as well as up to four recording units for meteorological parameters. One or more of such measuring units together form one sampling station, and the sampling stations in their turn are connected to, and controlled by, regional sub-centers including process computers and remote control units. The measurement data received and reduced by the regional sub-center is transmitted to the computer center for processing, statistical evaluation, and warning initiation. The air pollutants to be monitored are selected from among the compounds sulfur dioxide, hydrogen sulfide, nitric oxide, nitrogen dioxide, total nitrogen oxides, carbon monoxide, carbon dioxide, ammonia, hydrochloric acid, chlorine, hydrofluoric acid, ozone, oxidants, total hydrocarbons, and dust. The SO2 and ozone concentrations can be used as leading pollutants for smog alarm.

43761 **APTIC NO. 67337**

Braman, Robert S.

ARSENIC IN THE ENVIRONMENT. *Preprint, American Chemical Society, 18p., 1974. 17 refs. (Presented at the American Chemical Society, Meeting, Atlantic City, N. J., Sept. 1974.)*

Experiments for determining the extent of environmental contamination by arsenic are reviewed, with reference being made to various analytical methods for As determination and the different environmental forms of As. Air analysis of As which exists as fine particulate is particularly difficult but can be satisfactorily performed using a method adapted from water determinations of As compounds which involves reduction of methylarsenic acids or inorganic As to the corresponding arsines which are then separated and detected in an emission type systems with limits of detection well below 1 ng. Commercially used arsenicals appear to be biomethylated to volatile forms which have at least some local and possibly global migration. Ambient volatile As in air may be well below 1 ng/cu m in the absence of soil contamination, though air analysis have been limited to only a few locations. Topics requiring additional study include the amount of airborne As in places of human habitation and the evolution of methylarsenic compounds from lake water. Analytical data are tabulated for As determinations in air, water, and biological samples, including plants and human urine as well as for the evolution of arsines from As treated samples. A mechanism is illustrated for the environmental chemistry of As compounds.

43762 **APTIC NO. 66934**

Coleman, R. F.

COMPARISON OF ANALYTICAL TECHNIQUES FOR INORGANIC POLLUTANTS. *Anal. Chem., 46(12):989A-996A, Oct. 1974. 25 refs.*

Analytical techniques involving microscopy, atomic spectroscopy, mass spectrometry, X-ray spectrometry, neutron activation, and anodic stripping voltammetry are compared on the basis of sensitivity, accuracy, precision, multielement capability, and range of application for the determination of inorganic pollutants. Microscopy is excellent for identification of particulate matter, though it is not readily quantified and is not suitable for pollutants in solution. Atomic absorption and fluorescence are applicable to more than 60 elements, with determinations being sensitive and rapid; however, simulataneous multielement analysis with these methods is different. Multielement analysis is feasible with atomic emission techniques which are also sensitive and rapid, though flame sources have significant matrix effects. Mass spectrometry is a multielement technique with excellent sensitivity, and use of a plasma source promises rapid analysis; specialized sample preparation techniques, however, are necessary for the spark source and the plasma source is still in the development stage. Neutron activation analysis offers freedom from contamination and is applicable to a wide variety of matrices, though total time for multielement analysis may be long and the technique is of limited availability for routine analysis. X-ray fluorescence may be nondestructive, with direct examination often being feasible, though this multielement technique has limited sensitivity. Anodic stripping voltammetry is simple and offers excellent sensitivy for some elements, though a wide range of elements exists for which the technique is not suitable.

43763 **APTIC NO. 66960**

Dravnieks, Andrew

MEASURING INDUSTRIAL ODORS. *Chem. Eng. Deskbook, 1974:91-95, Oct. 21, 1974. 21 refs.*

Techiques of measuring industrial odors are reviewed. The human nose is being used increasingly in gas chromatography (GC) techniques. Human evaluation of an odor gives a tentative identity to the GC peak. A gas chromatograph with a sniffing port is described. Detectability, in terms of the amount of dilution with odor-free air needed to reduce the odor intensity to its threshold, is the only dimension more or less quantitively regulated by local ordinances. The ASTM D1391 Syringe Dilution Method for determining odors is described. Several other detectability tests are available, including the dynamic manifold olfactomer, the Hemeon olfactomer, the Sanders olfactomer, the odor fountain olfactometer, the odor room method, the mobile odor laboratory, and the forced-choice- triangle olfactometer. Detectability problems, sensory measurements, and sampling techniques are also discussed.

43764 **APTIC NO. 66613**

Durandeu, A., R. Sarteur, L. Perrot, and C. Collombel

DETERMINATION OF NITROGEN OXIDES IN THE AIR BY CHEMILUMINESCENT METHOD. *(Le dosage des oxydes d azote atmospheriques par chimiluminescence). Text in French. J. Eur. Toxicol., 7(1):63-66, Jan.-Feb. 1974. 6 refs.*

Sampling and calibration technique as well as the chemiluminescent method for the determination of nitric oxide and nitrogen dioxide in air have been developed. Sampling is done by means of a permeation tube at constant temperature with a splitter to obtain the desired dilutions for calibration. This technique is suitable for calibration gases in a concentration range of 1 ppb to 100 ppm. Nitric oxide is determined by means of Scott s chemiluminescence analyzer, using ozone at a rate of 50 cu cm per min under 10 mm mercury column vacuum for oxidation to NO_2. Carbon monoxide and ethanol caused negligible interference with the NO determination. The thermal converter needed for the reduction of NO_2 prior to its determination requires further improvement. Studies are being conducted on a trapping and enriching method, using silica treated with phosphoric acid at -80 C for adsorption for subsequent desorption of the nitrogen oxides at 140 C.

43765 **APTIC NO. 66954**

Endo, Kazuaki and Yoshio Nakai

EXAMINATION OF SULFUR OXIDE COLLECTION RATE BY LEAD DIOXIDE SHELTERS. *(Nisanka-en-ho ni okeru sheruta no io ankabutsu hoshuritsu no kento). Text in Japanese. Shizuoka-ken Kogai Boshi Senta Nenpo (Bull Environ Pollut. Contr. Res. Center Shizuoka Prefect.), no. 1:5-10, March 1974. 7 refs.*

When using the lead dioxide method of measuring sulfur oxides, the collection rates differ considerably depending on the shape of the shelter. The Shizuoka prefectural monitoring stations changed shelters in June 1972 from Type A to Type B (different manufacturers). Prior to changing, three types of shelters were used to examine comparative collection rates, using two samples each, on the roof garden of the Fuji City Library between Jan. and May 1972. After each month, the shelters were removed and sulfuric ion was quantitated by the weight method. The averages of Type A shelters were both 0.94 mg/day/100 cm, those of Type B were 1.26 mg and 1.17 mg, and Type C were 1.65 and 1.59 mg. Taking B as 100%, the collection rate of A was 77% and C ranged between 124-143%, averaging at 134%. There was no significant difference between two samples of the same type shelter, therefore, it was regarded as unnecessary to use two shelters for monitoring. Using the conversion coefficient of 1.30 from A to B, the measurements prior to May 1972 could be converted to comparable measurements for the records after June 1972. The annual averages of the A and B shelter lead dioxide measurement compared to that of electroconductivity measurements are 1.0 SO_3 mg/day/100 sq cm (0.034 ppm), and 0.5 SO_3 mg/day/100 sq cm (0.022 ppm).

43766 **APTIC NO. 66826**

Ettinger, H. J., M. I. Tillery, L. McGuire, and L. Ortiz

AEROSOL SIZE CHARACTERIZATION AND SAMPLING. *In: Annual Report of the Biomedical and Environmental Research Program of the LASL Health Division. Jan. through Dec. 1973. California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Atomic Energy Commission Contract W-7405-ENG36, Rept. UC-48, p. 25-27, May 1974. 1 ref.*

NTIS: LA-5633-PR

The spinning spiral channel aerosol size spectrometer for studying small airborne particulates and its performance are discussed. The advantages of an expanding channel spectrometer over the less expensive nonexpanding channel spectrometer are described theoretically. Thy equations will be solved by computer and compared with empirically derived calibration curves for the spectrometers to determine if the model is sufficiently representative. The equations do indicate that the expanding channel will require a greater length for deposition since the top of the nonexpanding channel drives the particles into a region of high centrifugal force. This suggests that the simpler, nonexpanding design is preferable from both a cost and usefulness point of view. Air sampling in the vicinity of glove boxes to determine hazards to workers from containment system leaks is also discussed. Optimum sampler location determination procedures are reviewed. Membrane filters can be used to collect particles which are then viewed for size determination by optical microscopy. Submicron particles can be collected by electrostatic or thermal precipitators and sized by electron microscopes.

43767 **APTIC NO. 67199**

Freedman, Herb

IN OR OUT? *Paper Trade J., 158(35):34-35, Sept. 2, 1974. 1 ref.*

Guidelines are given to assist management in deciding whether inhouse or outside testing services are advisable for environmental testing of air pollutant emissions and effluent streams. The use of service companies is almost invariably more economical if a firm does less than $20,000/yr of work per location with an environmental testing firm. Investigation of inhouse testing is warranted if the firm does between $20,000 and $60,000/yr of environmental testing work. Work with the environmental testing firms amounting to over $60,000/yr at one location may be more economically achieved by performing most of the tests inhouse and using the service company as an auditor. All firms electing to do inhouse testing should arrange to have the work audited by a responsible environmental quality laboratory, both for sampling methods and analytical techniques.

43768 **APTIC NO. 66821**

Giauque, Robert D., Lilly Y. Goda, and Roberta B. Garrett

X-RAY INDUCED X-RAY FLUORESCENCE ANALYSIS OF SUSPENDED AIR PARTICULATE MATTER. *Calif. Univ., Berkeley, Calif., Nuclear Chemistry Div., Atomic Energy Commission Contract W-7405-ENG-48, Rept. TID-4500-R61, UC-11, 61p., July 1974. 18 refs.*

NTIS: LBL-2951

A theoretical review is presented on critical aspects of X-ray induced X-ray fluorescence analysis that should be considered for quantitative elemental analysis of suspended air particulate matter. Topics convered include: sensitivity factors involving selection of the excitation radiation, geometry considerations, spectrometer characteristics, and substrate selection; determination of relative excitation-detection efficiencies; and determination of particle size effects. A method is illustrated for compensating for particle size effects when analyzing for lower atomic number elements by assuming that the larger suspended particles are collected in the form of a monolayer. Although the procedure requires that a weighted average value for the average mass thickness be employed, the net error in the result is relatively small due to the fact that the bulk of the mass concentration is usually within a relatively small range since the total mass of a particle can vary as the cube of the particle diameter.

43769 **APTIC NO. 66628**

Goldstein, S. A., A. P. D Silva, and V. A. Fassel

X-RAY EXCITED OPTICAL FLUORESCENCE OF GASEOUS ATMOSPHERIC POLLUTANTS: ANALYTICAL FEASIBILITY STUDY. *Radiation Res., 59(2):422-437, Aug. 1974. 45 refs. (Presented at the Symposium on the Jesse Effect and Related Phenomena, Gatlinburg, Tenn., Nov. 9-10, 1973.)*

Optical fluorescence from molecular gases and metallic vapors in argon and helium was elicited by irradiating gas mixtures with soft X-rays. Emission spectra from species of interest in toxicological and environmental studies, e.g., nitric oxide, nitrogen dioxide, carbon monoxide, sulfur dioxide, and mercury, were produced and characterized. Probable energy transfer processes accounting for the observed excitation are presented. These include nonselective direct routes involving collisions with photoelectrons, selective indirect routes involving collisions with excited atoms, e.g., sensitized fluorescence, Penning ionization (Jesse effect), and charge transfer, and routes involving relaxation phenomena, e.g., recombination and cascade. The development of an analytical technique for the determination of the previous molecular species, in addition to nitrogen and hydroxides, as ppm level impurities in rare gases was highly feasible. The determination of molecular pollutants in air samples, however, was hampered by the process of quenching by ground state nitrogen and oxygen molecules. (Author abstract)

43770 **APTIC NO. 66621**

Himi, Yasuji

PROBLEMS IN MEASUREMENT TECHNIQUES OF FLUE GASES: DUST MEASUREMENT TECHNIQUES. *(Endo haigasu no okeru sokutei gijutsu no mondaiten: baijin sokutei gijutsu). Text in Japanese. Preprint, Japan Assoc. for Thermal Energy Technology, Tokyo (Japan), 7p., 1974. 11 refs. (Presented at the Heat Management Conference, Tokyo, Japan, June 24-27, 1974.)*

Various problems in measuring dusts in flue gases are discussed. The location of sampling is very important, and should be selected by preparing a flow adjustment lattice prior to measurement. The vastly different concentration of dusts at various points in the cross section of the flue presents a problem. The concentrations should be obtained by sampling the gas at many points in a given cross section of the flue. The flue gas temperature affects the dust concentration. The temperature should be taken by a high speed suction thermometer, which is a thermocouple protected by a tube, and the gas drawn into the outer suction tube by a high speed fan brings the high temperature gas to the thermocouple without destroying it. Equating the speed of suction of sampling gas to the flow gas rate is most important. Adjustment by calculation is difficult because two diversely different (reverse) results have been obtained when the suction speed is either slower or faster than the gas flow rate. The use of glass wool in a dust tube has created problems, due to the chemical instability of the glass wool. Recently, more and more glass fiber filter paper is used. But paper is not mechanically strong, and it requires heat-treatment before gas sampling.

43771 **APTIC NO. 66595**

Iinoya, Koichi

PROBLEMS IN MEASUREMENT OF DUST PARTICLES. *(Funjin sokutei no mondaiten). Text in Japanese. Preprint, Japan Society for Chemical Engineering, p. 151-153, 1974. (Presented at the Japan Society for Chemical Engineering, Hokuriku Meeting, Toyama, Japan, July 17, 1974.)*

Problems for dust sampling in stacks by the constant speed suction method include errors due to the moment of inertia of particles, automation of the operation, acquisition of an average value for multi-point sampling, and the deposition of particles in sampling pipes. The measurement of particle size by the light scattering method requires dilution, and the operation is costly. Problems for dust measurements in the environment include the separation of 10 micron particles; concentration monitoring by light scattering, beta-ray transmission, light transmission, vibration plate, and filter paper method; and particle size determination by the light scattering method and by cascade impactors.

43772 **APTIC NO. 66895**

Inaba, H. and T. Kobayasi

INFRARED HETERODYNE LASER RADAR FOR REMOTE SENSING OF AIR POLLUTANTS BY DIFFERENTIAL ABSORPTION VIA SCATTERED ENERGY. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 108-110. 8 refs. (Sept. 3-6, Paper VI-13.)*

The differential absorption via scattered energy (DASE) method can be used to find the range-resolved density of a specific molecule by the difference in the electric backscattering intensities caused by Mie and Rayleigh scattering at two laser frequencies on and off an isolated absorption line of the molecule. A new scheme of laser radar (lidar) using infrared heterodyne detection with the DASE technique is described which provides a high sensitivity for the range-resolved measurement of important pollutants dispersed in the air. Improvements of 10 to the 5th or 6th power in sensitivity can be obtained with infrared heterodyne detection over direct detection. This method can be used to obtain information on the height distribution of various pollutants across the temperature inversion layer.

43773 **APTIC NO. 67196**

Ishikawa, Noboru and Masao Kusakabe

A NEW NITROGEN DIOXIDE DETECTOR. II. HEAT STABILITY TEST OF EXPLOSIVES. *(Nisanka chisso* *no kani kenchiho (dainiho), yoka kari sakusan seniso himaku no yoru abel no tainetsu shiken). Text in Japanese. Tokyo Kogyo Shikensho Hokoku, 69(4):132-135, April 1974. 2 refs.*

A method for the detection of nitrogen dioxide using cellulose acetate film mixed with potassium iodide was used to test the heat stability of explosives such as nitrocellulose, PETN, and gelatine dynamite. Two nitrocellulose samples judged stable according to the oridinary Abel test were discriminated according to stability by the new method due to its sensitivity. The film method also detected NO2 decomposed from dynamite and PETN samples which were judged stable by the Abel test. The effect of washing with water on the stability of PETN after synthesis was also tested using the film method; samples washed once emitted 55 ppm NO2 in an Abel test tube, whereas samples washed twice and three times emitted 25 and 10 ppm, respectively. An NO2 concentration of 4 ppm was found in a sample recrystallized from acetone.

43774 **APTIC NO. 66959**

Jeltes, R.

FINGERPRINTING TECHNIQUES AS AIDS IN THE ANALYSIS OF COMPOSITE CHEMICAL POLLUTANTS IN THE ENVIRONMENT.

J. Chromatographic Sci., 12(10):599-605. Oct. 1974. 30 refs. (Presented at the International Chromatography Meeting, Barcelona, Spain, Oct. 1974.)

Chemical fingerprinting techniques are extremely well-suited for identification, correlation, and source recognition of a variety of composite environmental pollutants, including many kinds of effluents and emissions. Chromatographic techniques are especially strong tools for this kind of activity. A series of examples of applications of these techniques are presented to show their potential for recognition and characterization of water, soil, and air pollutants. Application of these techniques need not be restricted to oil pollutant analysis is often assumed. The applications discussed are: determinations of mineral oil in water and soil, mineral oil in ground water, aromatics in gasoline, fatty oils in water, C1-C5 hydrocarbons in air, lower aromatics in air, and polynuclear aromatics in air. (Author abstract modified)

43775 **APTIC NO. 66933**

Jervis, Robert E., Bella Tiefenbach, and Amares Chattopadhyay

DETERMINATION OF TRACE CADMIUM IN BIOLOGICAL MATERIALS BY NEUTRON AND PHOTON ACTIVATION ANALYSES.

Can. J. Chem., 52(17):3008-3020, Sept. 1974. 50 refs.

Neutron and photon activation analyses were employed to determine trace cadmium residues in a variety of Canadian foodstuffs, soils, and other biological materials. The neutron activation procedure, based on radiochemical isolation of Cd-115, was used for detecting ppb concentrations of Cd in foods, vegetables, and scalp hair samples for residents feeding off of vegetation in the area examined; whereas the instrumental photon activation method, employing assay of Cd-111m with a solid state germanium-lithium detector, was used for soil, fertilizer, and a few vegetation samples. Bombardment at either 15 or 35 MeV was used for the latter activation method, with the higher energy bombardment giving a slightly higher sensitivity. Interference in samples containing appreciable amounts of indium and tin, however, was minimized by irradiating at the lower energy level. The Cd content of most of the foods ranged from 2-70 ppb. Agricultural soils contained 0.5-2 ppm Cd, some of which was attributed to fertilizers containing up to 5 ppm Cd. Vegetable crops grown on such soil generally contained 0.1-0.2 ppm Cd. Cadmium concentrations in scalp hair ranged from 0.25-2.7 ppm. Accuracy of the nuclear activation techniques, as assessed with standard reference materials and by comparison with atomic absorption, was generally in the 2-7% range. (Author abstract modified)

43776 **APTIC NO. 66902**

Kaizu, Yoshimasa, Hozumi Tamura, Masahito Kimoto, Hirohisa Shima, Yoshihisa Nagai, Masazumi Kawakami, Keiichi Araki, Tamaki Hashizume, Toshio Ueda, Koetsu Matsui, Munehiro Sugase, Norihito Miyamura, and Motohide Murata

AIR POLLUTION OBSERVATION BY LASER RADAR.

(Reza reda ni yoru taiki osen no kansoku ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center), no. 2:52-57, March 1974. 9 refs.

The potential uses of laser radar in connection with air pollution observation are: inversion altitude for temperature, visibility and air rarefaction, analyses of smog and fog particulate density distributions, and measurements of smoke distribution and effective stack height. Observation conditions are: transportation of the instrument to outside (desirably on the roof), determination of N (AC-180 degrees), and the balance adjustment by a level. The EL (elevation) is selected to avoid direct sun ray contact with the photoelectron amplifier. It must be confirmed that there is no obstruction between the object of observation and the laser. By RHI and RPI, scanning is given and the direction and elevation of objects are determined. The object is measured by an A scope and the distance, altitude (sin), and the horizontal distance (cos). An experimental observation was conducted. The weather conditions were disadvantageous, but the temperature vertical distribution obtained by a low altitude sonde, the inversion layer determined by A scope, and the altitude obtained by the echo signals generally agreed.

43777 **APTIC NO. 66704**

Kakizaki, I., K. Sekine, and T. Nakahira

THE CORRELATIVE COEFFICIENT BETWEEN RELATIVE CONCENTRATION APPARATUS AND STANDARD WEIGHT CONCENTRATION APPARATUS PROVIDED WITH LOW VOLUME AIR SAMPLER.

(Shitsunai fuyu funjin sokutei no hyojun (kijun) sokuteiho to sotai nodokei ni yoru sokuteiho to no kakusei keisu ni tsuite). Text in Japanese. Kuki Seijo (Clean Air J. Japan Air Cleaning Assoc., Tokyo), 12(2):14-23, July 1974. 5 refs.

The correlative coefficient obtained from a relative concentration apparatus was compared to that obtained from a standard weight concentration apparatus equipped with a low volume air sampler. The indoor air quality standard for suspended particulates is given in terms of the weight concentration of particulate per unit volume of ambient indoor air mg/cu m. The relation between CPM (the number of counts of output signal per min) to light scattering type apparatus (Desital P-III and D. U TYPE 5) and WC (weight concentration, mg/cu m) is WC equals 0.014 CPM. The coefficient of a photo-extinction type apparatus was not determined because of inconsistent data.

43778 **APTIC NO. 66914**

Keller, Juergen, K. L. Dunlap, and R. L. Sandridge

DETERMINATION OF ISOCYANATES IN THE WORKING ATMOSPHERE BY THIN- LAYER CHROMATOGRAPHY.

Anal. Chem., 46(12):1845-1846, Oct. 1974. 6 refs.

A thin-layer chromatographic method is described for the analysis of isocyanates in working atmospheres. The procedure is based on the determination of the ureas formed from the reaction of the isocyanates with N-4-nitrobenzyl-N-n-propylamine (nitro reagent). The method can be applied to both aliphatic and aromatic isocyanates, existing either as vapors or aerosol resins. Lower and upper concentrations levels for various isocyanates as determined by the method are given and range from 0.08-0.50 mg/cu m for the lower limit and 5-50 mg/cu m for the upper limit. The lower limit may be decreased by taking a larger air sample, and the upper limit may be increased by increasing the amount of nitro reagent or by decreasing the air sample volume. Since the isocyanate is reacted with a nitro reagent to form a stable derivative, the possibility of undesirable reactions of the collected isocyanates is eliminated. The only limitation of the method is that it cannot be applied to atmospheres which decompose the reagent by oxidation or reduction.

43779 **APTIC NO. 66875**

Kitamura, S., Y. Izawa, Y. Murakami, Y. Suzuki, Ch. Yamanaka, and M. Nishimura

LASER RADAR SYSTEM, ON-LINE DATA PROCESSING, AND ITS APPLICATION TO AIR POLLUTION AND METEOROLOGICAL STUDIES. *Proc. Int. Laser Radar Conf., 6th Conf., Laser Atmos. Stud., Sendai, Japan, 1974, p. 10-11. (Sept. 3-6, Paper I-5.)*

An on-line laser radar (lidar) system was developed at Osaka University for studies of air pollution and meteorological conditions. The system is described and a block diagram is given. The system is composed of a Q-switched ruby laser radar, automatic control devices for the direction of the radar and sequence of laser pulsing, and data processing systems. In this system the received echo signals are sampled, A/D converted, and then transferred to a digital computer for processing in the form of electrical signals or punched tapes. The digital computer is programmed to obtain the relative concentrations of aerosols on the path of a laser beam. A movable laser radar system was developed for observations of air pollution at urban areas. The system was used to observe the time changes of smog layers and temperature inversion layer and a power station plume. The data obtained can be used for quantitative analysis of aerosol structures and for construction of an air pollution model.

43780 **APTIC NO. 66958**

Kneip, T. J., R. S. Ajemian, J. R. Carlberg, J. Driscoll, L. Kornreich, J. W. Loveland, J. L. Moyers, and R. J. Thompson

TENTATIVE METHOD OF ANALYSIS FOR VANADIUM CONTENT OF ATMOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION SPECTROSCOPY. *Health Lab. Sci., 11(3):240-245, July 1974. 8 refs.*

Particulate matter samples can be collected by drawing a known volume of air through membrane or glass fiber filters. The samples are ashed and extracted with a mixture of nitric and hydrochloric acids. The analysis is subsequently made by atomic absorption spectroscopy using the 318.4 nm vanadium line. The method of additions is used to obtain greater accuracy. A nitrous oxide-acetylene flame is required. The method is applicable to the determination of vanadium in an optimum range of 1.0 to 20.0 micrograms/ml of solution. An atmospheric concentration of 0.2 microgram of V/cu m can be detected using the method. The interferences, precision and accuracy, apparatus, reagents, procedure, standards and calibration, and calculations for this method are discussed.

43781 **APTIC NO. 67225**

Krueger, John A., Martin S. Frant, and John H. Riseman

METHOD OF DETERMINING SULFUR DIOXIDE AND SENSING CELL THEREFOR. *(Orion Research Inc., Cambridge, Mass.) U. S. Pat. 3,803,006. 6p., April 9, 1974. 5 refs. (Appl. April 9, 1973, 9 claims).*

A potentiometric method for measuring dissolved sulfur dioxide in a sample solution is described which differs from conventional methods in that it can be used for continuous, real-time monitoring of SO2 concentrations. The method employs a gas sensing electrochemical cell which consists of a potentiometric hydrogen ion-sensitive electrode and a reference or standard electrode, both in contact with an internal standard solution. The internal standard consists of an aqueous solution of a sulfite salt and an SO2 oxidation inhibitor. A hydrophobic gas- permeable membrane separates the sample solution from the electrode internal solution. (Author abstract modified)

43782 **APTIC NO. 66633**

Liu, Y. H., V. A. Marple, K. T. Whitby, and N. J. Barsic

SIZE DISTRIBUTION MEASUREMENT OF AIRBORNE COAL DUST BY OPTICAL PARTICLE COUNTERS. *Amer. Ind. Hyg. Assoc. J., 35(8):443-451, Aug. 1974. 16 refs.*

An optical particle counter was calibrated for size distribution measurement of airborne coal dust particles. A differential electrical mobility analyzer was used with a fluidized bed dust feeder to produce uniform coal dust particles of a known size for calibration for particles less than 2.4 micron. For larger particles, the optical counter was calibrated with a microscopic technique. The output pulse height of the optical counter was significantly lower for coal particles than for spherical oil drops of the same particle size. The geometrical standard deviation of the output pulse height distribution of the optical counter for monodisperse aerosols increased from about 1.1 for spherical oil particles to about 1.8 for the irregularly shaped coal particles. Although this broadening effect reduced the ability of the counter to resolve small particle size differences, a numerical inversion procedure was developed which allowed the original size distribution to be recovered. Thus, the response of the optical particle counter to coal was significantly different from its response to ideal transparent spheres, but this can be properly corrected and systematic errors in the measurement size distribution eliminated by proper calibration and data reduction procedures. (Author abstract modified)

43783 **APTIC NO. 67234**

Liu, Benjamin Y. H., Richard N. Berglund, and Jugal K. Agarwal

EXPERIMENTAL STUDIES OF OPTICAL PARTICLE COUNTERS. *Atmos. Environ., 8(7):717-732, July 1974. 13 refs.*

The response characteristics of several commercially available optical particle counters were studied experimentally using monodisperse aerosols generated by the vibrating-orifice generator. The particle diameters ranged from 0.5 to 10 micron, and the particle refractive index from 1.4 to 1.6. Aerosol material used in the study increased dioctyl phthalate of 1.49 refractive index and Cargille index of refraction liquids of 1.4, 1.5, and 1.6 refractive indices. The response of the forward scattering counters was independent of the particle refractive index above 1 micron in particle diameter. The right-angle scattering counter showed a more pronounced particle refractive index effect. The experimental results were in good agreement with theoretical predictions of counter response based on Mie theory calculations. The resolution of the counter was studied as a function of the particle size. The relative standard deviation of the pulse height distribution increased with decreasing particle size due to the decreasing signal-to-noise ratio of the counter. A sheath-air inlet and a conical inlet are described. These new optical counter inlets improved significantly the resolution and the sampling efficiency of the counters. The use of the vibrating-orifice monodisperse aerosol generator as an aerosol concentration standard for evaluating sampling efficiencies of optical counters is described. (Author abstract)

43784 **APTIC NO. 66931**

Mark, D.

PROBLEMS ASSOCIATED WITH THE USE OF MEMBRANE FILTERS FOR DUST SAMPLING WHEN COMPOSITIONAL ANALYSIS IS REQUIRED. *Ann. Occupational Hyg., 17(1):35-40, 1974. 2 refs.*

Properties required of filter materials for use in the gravimetric sampling of airborne coal mine dust, when subsequent compositional analysis by infrared spectrophotometry is performed, are outlined, and results are presented from laboratory investigations with five types of membrane filters. Filter material characteristics required for gravimetric sampling of respirable mine dust for subsequent infrared analysis include: high collection efficiency (virtually 100%), minimal moisture effect, and negligible or predictable ash production which does not interfere in the infrared spectrogram for quartz. Test results are given for a Sartorius PVC filter, a Sartorius cellulose nitrate filter, two Gelman Metricel filters, a Millipore Polyvic filter, and a Whatman glass fiber filter (for comparison). All of the incinerated filter materials, with the exception of the Sartorius PVC filter which leaves no ash, show significant interference in the region of spectrogram corresponding to quartz peaks. The Sartorius PVC filter, however, appears to collect considerably less dust than the glass-fiber filters currently in use due to electrostatic repulsion of the dust particles by the filter during sampling. A method of treating the filters with a detergent solution appears to eliminate the undersampling of the PVC filter, while apparently not resulting in any other adverse effect.

43785 **APTIC NO. 66838**

Mitchell, William J. and M. Rodney Midgett

STUDIES OF THE FIELD RELIABILITY OF THE ORSAT ANALYZER. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Methods Standardization and Performance Evaluation Branch, 28p., June 1974. 3 refs.*

The results of four collaborative tests of Method Three of the Standards of Performance for New Stationary Sources - Gas Analysis for Carbon Dioxide, Excess Air and Dry Molecular Weight - are reported. Routinely using Orsat data to convert particulate emissions from combustion sources to the reference conditions of 50% excess air and 12% CO2 can introduce sizeable errors in the corrected particulate loading. Ways to improve the Orsat apparatus and increase the reliability of the data are suggested. The reliability of using individual CO2 and oxygen analyzers of the Fyrite type to determine stack gas molecular weight was investigated in both the laboratory and the field. The laboratory study, which was done using three cylinders containing mixtures of CO2, O2, carbon monoxide, and nitrogen of known concentration, determined that these analyzers give accurate carbon dioxide and oxygen analyses and thus yield accurate molecular weights. The results of the field studies also supported this conclusion. (Author abstract modified)

43786 **APTIC NO. 66659**

Motegi, Yoshimitsu, Kunio Hasegawa, and Masamichi Ozaki

AIR POLLUTION MONITORING SYSTEM---AIR POLLUTION MONITORING SYSTEM IN HYOGO PREFECTURE. *(Taiki osen kanshi shisutemu---Hyogo-ken ni okeru taiki osen kanshi shisutemu). Text in Japanese. Oyo Butsuri (Tokyo), 43(8):65-73, Aug. 1974. 2 refs.*

The roles of an air pollution monitoring system are the measurement and monitoring of atmospheric pollutant concentration, monitoring and control of pollutant emission, and providing information for the public. For the prevention of air pollution afflictions, a huge amount of data has to be processed hourly, and expedient systems of notifying the pollutant source and alerting the public are required. For these purposes, the air pollution monitoring system with telemeter and computer system is used. The functions required of such monitoring systems are described in terms of the reliability, possibility of expansion, workability, instantaneous response, and economical aspects. Taking as an example the pollution monitoring system used in Hyogo prefecture, the system structure, data file system, man- machine communication system, data processing, and statistic processing system and forecasting system are described with flow charts and photos of a datagraph.

43787 **APTIC NO. 66881**

Ohtsuka, Y. and Sasaki

LIGHT-BEAT MEASUREMENTS OF ATMOSPHERIC FLUCTUATIONS. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 152. 3 refs. (Sept. 3-6, Paper VIII-11.)*

Fluctuations of a laser light beam propagating through a turbulent atmosphere have been studied in the past by a standard method measuring the mean separation of two maxima in the spatial interference fringes and an alternative method which does not have the difficulty of getting a phase-difference angle above 2 pi between the two light beams to be interfered and measures the phase fluctuations in real-time. A new system was developed using light beat signal modulated by the atmospheric fluctuations. The technique to explore statistical properties of the turbulent atmosphere with the help of such a beat signal is discussed.

43788 **APTIC NO. 66678**

Ono, Keizo

AUTOMOTIVE EXHAUST GAS CONTROL AND MEASUREMENT APPARATUS (HC, DIESEL BLACK SMOKE). *(Jidosha haiki gasu no kisei to sokuteiki (HC, jizeru kokuen)). Text in Japanese. Gijutsu Joho (Serv. News), 5(6):2-6, June 1974.*

On January 1, 1975, exhaust gases from motor vehicles in Japan will come under further pollution control regulations. For vehicles powered by gasoline or liquefied petroleum gas, the emission of hydrocarbon (HC as normal hexane) must be in the range of 1200 ppm to 7800 ppm, depending on the type of vehicle. For diesel-powered vehicles, the black smoke exhaust should have a maximum pollution index of 50% (Bosch(?) value of 5). Hydrocarbon emission is measured with NDIR (non-dispersive infrared analyzer). The black smoke is caught on filter paper and the reflectivity of the blackness is measured. This article describes how these measuring devices work, and what care should be taken to obtain accurate readings.

43789 **APTIC NO. 66924**

Oswald, E. O., P. W. Albro, and J. D. McKinney

UTILIZATION OF GAS-LIQUID CHROMATOGRAPHY COUPLED WITH CHEMICAL IONIZATION AND ELECTRON IMPACT MASS SPECTROMETRY FOR THE INVESTIGATION OF POTENTIALLY HAZARDOUS ENVIRONMENTAL AGENTS AND THEIR METABOLITES. *J. Chromatog., 98(2):363-448, Sept. 25, 1974. 313 refs.*

The utilization of gas chromatography-mass spectrometry for the determination of some of the more important and potentially hazardous chemical compounds in the environment is reviewed. Factors affecting gas chromatography and mass spectrometry such as temperature, carrier gas, peak shape, efficiency of ionization, and ion source pressure are reviewed along with the usefulness of having analytical data prior to gas chromatographic-mass spectrometric analysis. Man-made environmental agents considered for analysis include: chlorinated hydrocarbons, particularly pesticides; plasticizers such as the synthetic phthalate esters; synergists such as piperonyl butoxide and its impurities; various drugs and food additives; and the organometallic methyl mercury. Natural environmental agents considered include: lipids and essential oils and amines and amino acid derivatives.

43790 **APTIC NO. 66589**

Palfitov, V. F., A. I. Loskutov, I. A. Kuzin, and V. N. Kott

ON THE POSSIBILITY OF USING FLUORINE-CONTAINING CARBON ADSORBENTS FOR CHROMATOGRAPHIC DETERMINATION OF GASES AND VAPORS. *(O vozmozhnosti primeneniya ftorsoderzhaschikh uglerodnykh adsorbentov dlya khromatografii gazov i parov). Text in Russian. Kolloidn. Zh., 36(4):802-803, 1974. 3 refs.*

Modified SKT type carbon in a grain size fraction of 0.3-0.5 mm and with a 31% fluorine content was used successfully for the selective separation of polar and chemically active gases and vapors from their mixtures for gas chromatographic determination. Effective separation was achieved of mixtures of water-methanol, hydrogen-air-carbon dioxide, ethanol-methanol, ammonia-water, hydrogen-air-methane-water-ethane, air-carbon dioxide-sulfur dioxide, air-carbon dioxide-sulfur trioxide, and air-hydrogen sulfide. The fluorine-containing adsorbent excels by adequate resistance to thermal, chemical, and mechanical effects.

43791 **APTIC NO. 66888**

Reckzeh, G. and W. Dontenwill

A SAMPLER FOR LONG-TERM MONITORING OF AIRBORNE BACTERIA. *(Monitor fuer Langzeitmessungen von Luftkeimen). Text in German. GIT (Glas Instrum. Tech.) Fachz. Lab., vol. 18:774-780, Aug. 1974.*

A modified air sampler for quantitative determination of airborne bacteria is described. The device operates on the impaction principle and can be programmed to carry out fully automatic checks over varying periods up to 24 hrs. Intervals between the different sampling programs can be varied, and automatic time markings on the culture medium serve to correlate the contamination values obtained to the time of the test. The monitor can thus provide a graph over a 24 hr period of the bacterial level of such areas as operation rooms, intensive care units, pharmaceutical manufacturing areas, and air conditioning plants, aside from measuring the contamination at any given moment. The device can also be used to locate possible sources of bacterial contamination.

43792 **APTIC NO. 66886**

Robinson, J. W. and W. M. Reid

STUDIES ON THE FEASIBILITY OF THE DETERMINATION OF SULFURIC ACID AEROSOL IN AUTO EXHAUST GASES BY LASER INDUCED INFRARED EXCITATION. *Environ. Letters, 7(3):195-206, 1974. 9 refs.*

The feasibility of in situ determination of sulfuric acid aerosol in automobile exhaust (generated by automobiles with catalytic converters) was investigated using laser induced infrared excitation. Spectral emission from H_2SO_4 was induced by focusing a carbon dioxide laser, with a principal lasing line of 10.6 micron, into H_2SO_4 aerosol produced by an aspirator. The emission spectrum of excited H_2SO_4 was somewhat different from the spectrum obtained by thermally heating the molecule. A characteristic H_2SO_4 infrared emission band was then monitored to determine the H_2SO_4. Emission intensity was independent of laser power at the optimum operating conditions of 1 l/min aspirator flow rate and 25 watt laser power. Although the calculated sensitivity of the method was about one order of magnitude below that needed for monitoring automobile exhausts for H_2SO_4 aerosol, it was projected that with increased laser power the volume of sample could be greatly enlarged, thus increasing the volume of air monitored and in turn increasing the sensitivity of total H_2SO_4 excited. (Author abstract modified)

43793 **APTIC NO. 66961**

Sawicki, E., P. R. Atkins, T. Belsky, R. A. Friedel, D. L. Hyde, J. L. Monkman, R. A. Rasmussen, L. A. Ripperton, J. E. Sigsby, and L. D. White

TENTATIVE METHOD OF ANALYSIS FOR POLYNUCLEAR AROMATIC HYDROCARBONS IN COKE OVEN EFFLUENTS. *Health Lab. Sci., 11(3):218-227, July 1974. 7 refs.*

A method is described for analyzing polynuclear aromatic hydrocarbons in coke oven effluents by a gas chromatography/ultraviolet absorption spectrometry technique. The principle of the method, range and sensitivity, interferences, precision and accuracy, apparatus, reagents, procedure, calibration and standards, calculations, and the effect of storage are described. Samples are prepared as a solution in a saturated hydrocarbon solvent such as cyclohexane. After the addition of an internal standard to the sample, a concentrate is prepared. An aliquot of concentrate is injected into a gas chromatograph to obtain fractions for measurement by ultraviolet spectrophotometry. Based on the ultraviolet spectra, microgram quantities of the various polynuclear aromatic compounds are calculated. From 0.1-10 mg of cyclohexane soluble material can be handled by the method. Individual polynuclear aromatic hydrocarbons are present at concentrations of 1-4 micrograms. The lower limit of detectability for each hydrocarbon is 0.1 microgram.

43794 **APTIC NO. 67327**

Smith, Franklin and Denny E. Wagoner

GUIDELINES FOR DEVELOPMENT OF A QUALITY ASSURANCE PROGRAM: VOLUME II - GAS ANALYSIS FOR CARBON DIOXIDE, EXCESS AIR, AND DRY MOLECULAR WEIGHT. *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1234, Program Element 1HA327, ROAP 26BGC, Rept. EPA- 650/4-74-005-b, 66p., Feb. 1974. 13 refs.*

NTIS: PB 235755/AS

Guidelines for the quality control of stack gas analysis for carbon dioxide, excess air, and dry molecular weight by the Federal Reference Method are presented for use by operating personnel. Major subdivisions of the quality assurance procedures include: an operations manual, a manual for field team supervisors, and a manual for managers of groups of field teams. Topics covered include: apparatus requirements, presampling preparation, on-site measurements, postsampling operations, assessment of data quality, suggested performance criteria, collection and analysis of information for identifying trouble, functional analysis of test methods, procedures for performing quality audits, and data quality assessments.

43795 **APTIC NO. 66687**

Sugimae, Akiyoshi

EMISSION SPECTROGRAPHIC DETERMINATION OF TRACE ELEMENTS IN AIRBORNE PARTICULATE MATTER COLLECTED ON SILVER MEMBRANE FILTER. *Appl. Spectry., 28(5):458-461, Sept./Oct. 1974. 18 refs.*

An emission spectrographic method is described to determine the concentrations of aluminum, bismuth, cadmium, chromium, iron, lead, manganese, molybdenum, nickel, tin, vanadium, and zinc in airborne particulate matter collected on a silver membrane filter. The sample filter is dissolved with dilute nitric acid. Hydrochloric acid is added to precipitate silver ion as silver chloride. After the solution is evaporated to dryness, the residue is subjected to dc arc excitation. The precision of the method is better than 18%. (Author abstract)

43796 **APTIC NO. 66868**

Suzuki, Jiro

SULFUR DIOXIDE AND SULFUR TRIOXIDE GAS SAMPLING DEVICE. *(SO_2, SO_3 sokuteiyo haigasu saishu sochi). Text in Japanese. (Central Power Research Inst. (Japan)) Japan. Pat. Sho 49-22237. 3p., June 14, 1974. (Appl. Nov. 1, 1969, 1 claim).*

An invention designed to improve the previous flue gas sampler which frequently yielded varying results due to the chemical reaction and adsorption of sulfur trioxide in the sampler is described. The gas probe is a quartz tube with a bulb section which is packed with quartz or glass wool for dust collection and a probe tube which is inserted into the flue but having no dust collection device as it did in previous samplers. THe bulb is packed with quartz or glass wool so that the size of fiber will be 7-10 microns and the packing density will be 0.3 g/cu cm, and the length of the packing will be 8 cm. The packing material is pretreated with 1N hydrochloric acid. The entire sampler, the gas suction quartz tube, and the bulb are heated to less than 350 C but higher than the acid dew point. By this device, the flue gas drawn into the tube will slow down the speed in the packed bulb, the soot will be effectively collected. Since the glass wool is treated and the surface alkali is neutralized, the reaction of SO3 in the flue gas will not occur and since the entire tube is heated, adsorption of SO3 to the quartz tube will be avoided.

43797 **APTIC NO. 66883**

Tsuji, T., Y. Higuchi, and H. Kimura

MEASUREMENT OF NO2 CONCENTRATION IN THE ATMOSPHERE USING ABSORPTION TYPE TWO-WAVELENGTH DYE LASER RADAR. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 103-104. (Sept. 3-6, Paper VI-10.)*

An absorption laser radar (lidar) developed that can automatically and remotely measure the nitrogen dioxide concentration in the atmosphere. The NO2 absorption spectrum has a train of definite peaks and valleys between 4000 and 5000 A. A two-wavelength laser beam corresponding to a peak and a valley of the NO2 absorption spectrum is transmitted, and the intensity of the scattered light from the target is discussed. The concentration is obtained using a mathematical relation. The transmitter consists of a pulsed DAMC organic dye laser and simple optics. The detecting system consists of a reflection-type 50 cm diameter telescope, optical filters for intercepting background noise, a photomultiplier, and a photodiode. The apparatus was tested, and the results were consistent with those obtained by the Saltzman method. A precision of 0.2% was obtained.

43798 **APTIC NO. 66894**

Wakimoto, Tadaaki, Ryo Tatsukawa, Tsunehiko Ogawa, and Isao Watanabe

DETERMINATION OF ORGANOCHLORINE PESTICIDES AND PCB IN AIR BY DRY COLUMN COLLECTION METHOD. *(Kanshiki saikiho ni yoru taikichu no yuki enso kagobutsu no teiryoho). Text in Japanese. Bunseki Kagaku, (Japan Analyst (Tokyo)), 23(7):790-793, 1974. 4 refs.*

A dry column collection method is described for the determination of trace amounts of organochlorine pesticides such as benzene hexachloride and dichlorodiphenyltrichloroethane as well as polychlorinated biphenyl compounds in air. The organochlorine compounds are collected quantitatively with a column packed with 5% (by weight) glycerine-coated Florisil. The detection limits are 0.0005 micrograms/cu m for BHC isomers and 0.002 micrograms/cu m for PCBs. The dry collection method is more sensitive, less expensive, and easier to handle in comparison with impinger methods. The collection method is also applicable to other air pollutants such as some organophosphorus compounds and phthalic acid esters with minor modifications.

43799 **APTIC NO. 66703**

Watanabe, Ikuo and Toshiichi Okita

IDENTIFICATION OF THE COMPOUNDS EVAPORATING FROM WASTE WATERS OF PETROCHEMICAL PLANTS. *(Sekiyu kagaku konbinato no haisui yori kihatsu suru seibun no dotei). Text in Japanese. Taiki Osen Kenkyu (J. Japan Soc. Air Pollution), 9(1):13-20, Sept. 1974. 20 refs.*

Odorous compounds evaporating from the waste waters of petrochemical plants were identified using gas chromatography with infrared spectrometry. The technique consists of collecting the effluent gas fractions from a gas chromatograph, introducing the fraction into a gas cell, and measuring them on an infrared spectrometer. The compounds were light hydrocarbons, inorganic and organic sulfur compounds, chlorinated hydrocarbons, and aromatic hydrocarbons. The compound in greatest abundance was 1,2-dichloro-ethane, followed by propane, propylene, ammonia, benzene, toluene, xylenes, and ethyl benzene.

43800 **APTIC NO. 67312**

Wheeler, G.

AN APPLICATION OF CONTINUOUS PHOTO-ELECTRIC SMOKE DENSITY METERING AT LLANWERN SINTER PLANT. *British Steel Corp., Strip Mills Div., SM/TN/B/1213, 18p., 1974 (?).*

A study was made of the continuous photoelectric smoke density metering at the Llanwern sintering plant to establish an alternative to isokinetic dust sampling for assessing the degree of pollution caused by inefficiencies within the dust collecting system. The photoelectric obscurometer provided a useful means of continuously monitoring the dust emission from chimney stacks. The obscurometer had a distinct advantage over isokinetic sampling in that it gave an instantaneous indication of dust emissions. The dust collecting system in the plant is an electrostatic precipitator using rapping for cleaning of the electrodes. Spraying water into the discharge end of the sinter machine to humidify the dust laden air stream and thus reduce the resistivity of the dust particles was tested. It was necessary that particular attention be paid to the degree of cooling that is achieved, since it is possible to cool the air stream from 220 C to 100-180 C, thus causing an increase in the dust resistivity and obscuration. A decrease in the dust emission could be achieved by adopting the principle of discontinuous rapping. A calibration curve relating optical density to weight concentration was obtained from theoretical considerations and a size analysis of the dust in the chimney stack. It predicted values of weight concentration higher than experienced. The discrepancy arose from the fact that the bulk of the obscuring effect is caused by submicron particulates. The optical density of dispersoids (extinction of light beams) and the determination of the equilibrium mixture temperature are discussed in appendices.

43801 **APTIC NO. 66869**

Yoshikawa, M., M. Hoshiyama, and A. Nishitsuji

SCATTERING PARAMETERS FOR THE LASER RADAR EQUATION. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos, Stud., Sendai, Japan, 1974, p. 74-76. (Sept. 3-6, Paper V-7.)*

Scattering parameters are discussed in order to analyze laser radar (lidar) echoes as one study on quantitative measurements of air pollution. Water droplets which are components of haze, fog, and clouds, are chiefly considered. The particle size distribution (Nr) must be known for the analysis of the laser radar equation. The laser radar equation, scattering parameters, scattering parameters for various refractive indices, and an application of scattering parameters in a study of laser radar echoes from clouds are discussed.

43802 **APTIC NO. 66870**

Yoshikawa, M., M. Hoshiyama, and A. Nishitsuji

QUANTITATIVE MEASUREMENT OF AIR POLLUTION BY LASER. *Proc. Int. Laser Radar Conf., 6th Conf., Laser Atmos. Stud., Sendai, Japan, 1974, p. 93-95. (Sept. 3-6, Paper VI-4.)*

Air pollution can be quantified from attenuation of an electromagnetic wave which propagates through air. Many experiments have been done using the transmission method in which the transmitter and the receiver are located on a straight line, and attenuation is measured between them. Air pollution is known to have various particle size distributions (Nr). Attenuation is therefore greatly affected by Nr. The theory of air pollution measurement using laser is discussed, chiefly considering water droplets. The Nr must be taken into consideration as one of the main causes of the change of attenuation, and the fittest frequency is needed to quantify air pollution accurately.

43803 **APTIC NO. 66913**

Zafonte, Leo, William Long, and James N. Pitts, Jr.

EVALUATION OF AN OZONE PHOTOMETER FOR AMBIENT OZONE MEASUREMENTS. *Anal. Chem., 46(12):1872-1874, Oct. 1974. 5 refs.*

An evaluation of instrumental response, calibration, and linearity for an ultraviolet ozone photometer designed for routine airborne atmospheric ozone monitoring is presented. Accuracy, repeatability, and linearity of the ultraviolet absorption technique were satisfactory, and the unit responded to within 98% of the step ozone input within one measurement period (11 sec). Although the instrument s maximum delay (response) time was 11 sec, the actual in-practice difference between time of ozone measurement and its display was only 1-2 sec because the measurement time falls within the latter half-cycle operational mode. No apparent inteferences due to nitrogen dioxide, hydrocarbons, or sulfur dioxide appeared, based on studies at ambient concentrations. Comparison of the ultraviolet ozone measurement device with an ozone-ethylene chemiluminescent monitor during one flying run resulted in agreement within 0.01 ppm ozone at low ozone concentrations encountered.

43804 **APTIC NO. 66610**

TOTAL HYDROCARBONS AS A LEADING COMPONENT FOR AIR QUALITY MONITORING. *(Gesamtkohlenwasserstoffe als Leitkomponente zur Luftueberwachung). Text in German. Chimia, 28(8):432-433, Aug. 1974.*

A Beckman total hydrocarbon analyzer is described. Total hydrocarbons can be used as indicator substances for air pollution monitoring in urban agglomerations and industrial areas as combustion processes generate unburnt hydrocarbons as air pollutants. The total hydrocarbon analyzer model 1273 uses a flame-ionization detector with hydrogen flame for the proportional determination of the total carbon content relative to methane. The measuring ranges that can be selected on the instrument are 0-20 and 0-200 ppm methane. The nearly autonomous instrument can be installed in vehicles and exposed in remote areas.

43805 **APTIC NO. 66611**

AIR POLLUTION MONITORING NETWORKS ABROAD. *(Reseaux de mesure de la pollution atmospherique a l etranger). Text in French. Pollut. Atmos. (Paris), 16(62):207-212, April-June 1974.*

Principal characteristics of air pollution monitoring networks installed in Rotterdam, Osaka, Tokyo, Kawasaki, Los Angeles, Saint-Louis, Minneapolis, Chicago, Detroit, New York City, Pittsburgh, Baltimore, Seattle, Portland, and Munich are presented. Depending on the magnitude of the area surveyed by the individual stations, the monitoring networks can be divided into urban and regional ones, the scope of action of the latter ranging from about 100 to 300 sq km per station. Sulfur dioxide, hydrogen sulfide, nitrogen dioxide, nitric oxide, carbon monoxide, hydrocarbons, methane, oxidants, aldehydes, particulate matter, as well as the coefficient of haze are among the substances measured. Most stations also monitor the atmospheric conditions, e.g., wind speed and direction, temperature, relative humidity, precipitation, and solar radiation.

43806 **APTIC NO. 67330**

Hawker Siddeley Dynamics Ltd., Hatfield (England)

THE INFLUENCE OF THE ATMOSPHERE ON REMOTE SENSING MEASUREMENTS. VOL. 2. ULTRAVIOLET, VISIBLE AND INFRARED REGIONS. *Rept. HSD TP7400, ESRO CR(P)-354, 1974 (?). 171 refs.*

NTIS: N7420987

Atmospheric influences on remote sensing are reviewed for wavelengths from the ultraviolet to the infrared region. The earth s atmosphere is described in terms of such processes as gaseous absorption and emission, particle scattering, refraction, and turbulence. The influences of these atmospheric processes on passive and active sensors mounted on various platforms are reviewed, and correction techniques to restore atmospherically degraded data to an error-free form are examined. The effects of gaseous and particulate pollutants added to the atmosphere are also examined in terms of signals received by remote sensors. The effects of the presence of gases can range from a simple local enhancement of trace gas concentration to the formation of chemically complex photochemical smogs in the lower atmosphere. Particulate emission into the atmosphere add to the natural aerosol level, with manmade sources perhaps accounting for 5-10% of the total loading. (Author abstract modified)

43807 **APTIC NO. 67365**

Diesel Engine Manufacturers Assoc., Cleveland, Ohio

DEMA EXHAUST EMISSION MEASUREMENT PROCEDURE FOR LOW AND MEDIUM SPEED INTERNAL COMBUSTION ENGINES. *Cleveland, Ohio, Diesel Engine Manufacturers Assoc., 1974, 56p.*

An exhaust emission measurement procedure is described for low and medium speed stationary liquid, dual fuel, and gas fueled internal combustion engines. Compounds measured in the procedure are: carbon monoxide, hydrocarbons, methane, oxides of nitrogen, nitric oxide, nitrogen dioxide, sulfur dioxide, particulate matter, carbon dioxide, and oxygen. The procedure description is outlined in terms of compounds to be measured, general arrangement of test equipment, tests to be run and their procedures, computations to be performed, presentation of final results, and comments regarding new instrumentation. Appendices present all necessary details of the steps needed to obtain the final results and include: abbreviations and molecular weights, definitions of terms, measurement of individual pollutants, data to be recorded, and computation of results.

1973

43808 **APTIC NO. 66940**

Akiyama, Kazuyuki, Shinji Nagashima, Kazumasa Fujitani, Rieko Takahashi, and Hiroshi Noushi

COLLECTION AND MEASUREMENT OF PCB IN THE AIR. *(Kukichu PCB no hoshu sokuteiho ni tsuite). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):82, April 1973.*

As methods of collecting and measuring airborne PCB, (a) the 5% glycerine-florigel column method, (b) n-hexane absorption method (double impingers and dry ice-acetone cooling), (c) acetone absorption method, and (d) hi-vol samplers were examined. Mixtures of KC 300, 400, and 600 were heated and mixed with the air and used as samples for examining the collection efficiencies of the above mentioned methods. For the high-vol method, KC 300, 400, 500, and 600 were painted on filter paper, and the recovery rate was obtained from the remaining amount. The (a) method showed high collection rates for all peaks on the gas chromatogram. The (b) and (c) methods were also good, but the measurement tended to be low for low chlorine counts. The hi-vol method yielded a good collection rate for the latter half peaks, but up to the tenth peak, in the low chloride area, the collection rates were low. For (b) and (c), the medium loss was about 15%. When these methods are utilized for measurements of air quality and combustion gas for PCB, the clean up of the equipment, identification method, and the numerical expression of concentration measurement are still problematical.

43809 **APTIC NO. 66847**

Black, Francis M., Larry E. High, and John E. Sigsby

THE APPLICATION OF TCTAL HYDROCARBON-FLAME IONIZATION DETECTORS TO THE ANALYSIS OF THE COMPLEX HYDROCARBON MIXTURES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., 20p., 1973 (?). 10 refs.*

The application of total hydrocarbon-flame ionization detectors to the analysis of complex hydrocarbon mixtures is described. Nine of the most abundant auto exhaust hydrocarbons relative to propane, the compound commonly utilized for calibration, were analyzed: methane, isopentane, isooctane, ethylene, propylene, acetylene, benzene, toluene, and p-xylene. Analytical error predictions are made based on the relative response and abundance of these hydrocarbons in samples from 1972, 1974, and prototype 1975 vehicles. The predicted, and actually experienced, errors are greatest for the prototype 1975 vehicles. The magnitude of error will depend to a large extent on the detailed composition of the mixture being analyzed and on the relative response of the individual sample species to the calibration species. The magnitude of potential error when utilizing these instruments for auto exhaust analysis with propane as a calibration compound is illustrated. The significance of the problem is greater in application to vehicles employing catalytic emission control than to vehicles without emission control. This results from the impact of the catalyst on exhaust composition. (Author abstract modified)

43810 **APTIC NO. 67293**

Dueker, Richard L.

SPECIFICATIONS FOR THE DEVELOPMENT OF INSTRUCTION MANUALS FOR AUTOMATIC AIR MONITORING INSTRUMENTS. *Applied Science Associates, Valencia, Pa., Office of Air and Waste Management Contract 68-02-1078, Rept. EPA-450/3-74-038, 132p., Dec. 1973.*

NTIS: PB 235114/AS

Specifications for the development of instruction manuals for automatic air monitoring instruments are presented to provide a guide for manufacturers in the development of instruction manuals for continuous air monitors. Topics covered include: maintenance task analysis, job guides development, troubleshooting aids development, general requirements, and quality and accuracy assurance provisions. General definitions and a verb list are also provided. Guidelines for in-process review and verification of the instruction manual are presented in two appendices.

43811 **APTIC NO. 67023**

Fowler, Eugene E. and Walter D. Tucker

POTENTIAL APPLICATIONS OF ISOTOPES IN POLLUTION CONTROL. *Preprint, 22p., 1973. 34 refs. (Presented at the Japan Conference on Radioisotopes, 11th, Nov. 1973.)*

The use of radioisotopic and nuclear methods in research and development on environmental pollutants and their control is well established. The next few years should see not only the routine application of methods already demonstrated, but also some interesting and innovative approaches to problems as yet unsolved. Some of the potential applications of isotopes in pollution discussed include activation-analysis of trace contaminants in particulates and biological materials by thermal neutron activation, neutron activation, instrumented nuclear activation, and instrumental photon activation. Isotopes can also be used as tracers in studies of water pollution, pollution dispersion, and other areas. Radioisotope gauges can be used to measure physical properties such as suspended sediments, sludge densities, particulate densities, and dust loadings. The radiation treatment of sewage and waste water can be used as a control technique, by killing bacteria, increasing the sedimentation rate, altering the colloidal properties of the solids in waste water, or reduction of organic pollutants.

43812 **APTIC NO. 66962**

Radulescu-D., N.

METHOD FOR THE ZONAGE OF THE URBAN ATMOSPHERIC POLLUTION ON BASIS OF CONDENSATION NUCLEI DETERMINATIONS. *Igiene Mod. (Parma), 66(4)422-428, Aug. 1973. 5 refs.*

Condensation nuclei concentrations can serve only as a global, nonspecific pollution indicator. A scale is proposed for estimating the degree of pollution on the basis of condensation nuclei (CN) determinations. In order to compare the pollution of various towns, a CN indicator is determined for each town by calculating the interzonal average for the considered town. The simple, approximative method of plotting curves of equal average concentrations in a town having a great ferrous metallurgical industry is described. The urban atmosphere in the town is divided into zones on the basis of CN determinations. The CN determination method offers real advantages compared to direct, specific methods, especially when a rapid examination of the pollution is required.

43813 **APTIC NO. 67329**

Roessler, J.

AIR POLLUTION MEASUREMENT BY LASER. *(Laser messen die Luftverschmutzung). Text in German. Umschau (Frankfurt), no. 11:343-344, June 1973. 3 refs.*

The use of lasers in air pollution measurement is reviewed. Laser radar systems can be employed to localize and qualitatively measure both solid and gaseous air pollutants by remote means. The use of lidar in connection with air pollution alarms is also discussed.

1972

43814 **APTIC NO. 66717**

Brasser, L. J.

MEASUREMENT AND CONTROL OF AIR POLLUTION. *(Meting en bestrijding van luchtverontreiniging). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (Ed.), Amsterdam/Brussels, Intermediair, 1972, p. 94-116. 10 refs.*

Air pollution measurement and monitoring techniques, and methods available for pollution abatement are described. Coulometric and colorimetric analyzers have been developed for the automatic measurement of sulfur dioxide concentration in air quality monitoring networks. The national air pollution monitoring network set up in the Netherlands currently supply only SO2 information data, but nitrogen dioxide and carbon monoxide concentration measurements are also envisaged. The influence of meteorological factors on the concentration data can be reduced by increasing the sampling time, whereby extreme values can be largely eliminated. It is possible to determine the probability of concentrations in excess of a given limit from concentration distribution curves obtained from regular measurements. The contribution of new emission sources to the pollution level can be determined from regular monitoring before and after the new source was put into operation. Air pollution can be abated by switchover to other raw and auxiliary materials in the production process, and by design improvement of technological equipment. If emissions can not be prevented in this manner, the emitted pollutants have to be separated or diluted in the atmosphere. The use of new sources of energy and exhaust gas purification are the basic possibilities of traffic-generated pollution abatement. The use of unleaded gasoline may give rise to new pollution problems due to the emission of more aromatic hydrocarbons.

43815 **APTIC NO. 66726**

Brownrigg, J. T., J. Guilfoyle, and A. W. Hornig

IDENTIFICATION OF PCB S IN THE PRESENCE OF DDT-TYPE COMPOUNDS USING LOW TEMPERATURE LUMINESCENCE. *Am. Chem. Soc., Div. Water,* *Air Waste Chem., Gen. Papers, 12(2):67-72, 1972. 14 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 164th, New York, Aug. 18-Sept. 1, 1972.)*

The applicability of low temperature (77 K) luminescence spectroscopy to the problem of identifying polychlorinated biphenyl compounds in the presence of pesticides of the dichlorodiphenyltrichloroethane (DDT) type was investigated using a fluorescence spectrophotometer to analyze various PCB isomers, PCB mixtures, mixtures of DDT-type compounds, and mixtures of PCB and DDT-type compounds. Interference from emitting solvent impurities limited detection sensitivities to approximately 1 ppm for DDT-type compounds and approximately 0.01 ppm for PCB mixtures, though the resulting excitation-emission spectra obtained indicated the usefulness of the method for such determinations. The results also indicated that the method might also be useful as an adjunct to other methods such as gas chromatography, particularly for the analysis of polychlorinated terphenyls present in certain PCB preparations.

43816 **APTIC NO. 66729**

Hughes, Ernest E. and J. K. Taylor

STANDARD REFERENCE MATERIALS FOR AIR POLLUTION AND GAS ANALYSIS. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 12(2):238-243, 1972. 6 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 164th, New York, Aug. 28-Sept. 1, 1972.)*

Standard reference materials for air pollution and gas analysis are reviewed in terms of materials presently available and substances being investigated as possible standard references. Materials which are currently available as National Bureau of Standards Standard Reference Materials are oxygen in nitrogen, carbon dioxide in nitrogen, methane in air, and sulfur dioxide permeation tubes of three different sizes. Materials which are imminently available are carbon monoxide in air or nitrogen, propane in air, sulfur dioxide in nitrogen, and nitrogen dioxide permeation tubes. Substances which are being investigated as possible standard reference materials are nitric oxide in nitrogen and a standard ozone generator. Ozone can only be produced at known concentration in a dynamic system in which the ozone is generated immediately prior to use.

43817 **APTIC NO. 66837**

Jackson, J.

INFRA-RED GAS ANALYSERS USING SOLID-STATE DEVICES. *Proc. Eur. Elec.-Op. Mkts. Technol. Conf., 1st, Geneva, Switzerland, 1972, p. 17-22.*

The concentration of certain polyatomic gases in a mixture of gases can be determined from the infrared absorption at a wavelength characteristic of the gas being measured. This principle has been used in nondispersive infrared gas analyzers for over 30 years, most of these instruments using a selective capacitor-microphone detector of the Luft type. Recent developments of devices such as photoconductive detectors, interference filters, and solid-state modulators for the infrared have made possible the design of a new generation of nondispersive infrared gas analyzers. These instruments are free from microphony, portable, and have the reliability of solid-state devices and no moving parts. A novel feature of the instruments of the use of an yttrium-iron-garnet magneto-optic modulator with a silicon Brewster window to provide an infrared beam direction switch. A dual-wavelength gas analyzer using this principle can be made so that both reference and sample beams are coincident in the sample cell. Typical performance of such a system using a 1 cm sample cell and a room temperature cadmium-mercury-telluride detector is a minimum detectable concentration of 120 ppm carbon dioxide with a time constant of 100 min, and a linearized measuring range of 0-10%. Infrared gas analysis can be used in the chemical industry, steel industry, vehicle exhaust measurement, and medicine. Particular applications for a solid-state analyzer occur in air-, or ship-borne applications for the detection of fuel or oil vapor leaks and in the monitoring of cabin atmospheres. The dual- wavelength analyzer is also suitable for long-path or even open-path pollution monitoring. (Author abstract modified)

43818 **APTIC NO. 67380**

Korth, Merrill W., H. Anthony Ashby, and Ralph C. Stahman

EMISSION MEASUREMENT TECHNIQUES FOR NON-CONVENTIONAL POWERPLANTS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 971-976. 11 refs. (Sept. 25-29, Paper 729143.)*

A number of procedures for collection and analysis of exhaust emissions fro unconventional power systems are described, including high capacity constant volume sampling, continuous analysis, fuel-based procedure, carbon dioxide tracer technique, proportional sampler, and constant volume sampling with heated continuous hydrocarbon analysis. The advantages and disadvantages of each are enumerated. Selection of the appropriate procedure is a function of the type of information desired and the availability of test equipment. Emissions information of maximum value to the Environmental Protection Agency must be related to existing Federal emission standards and procedures. However, for engine component development, continuous analysis under steady state and transient cycling conditions is also necessary. Characteristics are described of the unconventional power plants of the Brayton cycle, the Rankine cycle, stratified charge, diesel, Wankel, hybrid, and Stirling engines. The present Federal emission test procedure using constant volume sampling is described. (Author summary modified)

43819 **APTIC NO. 67011**

McMullen, R. G.

AMBIENT AIR PROGRAMS - AN INACCURATE MEASUREMENT. *In: Air Quality Instrumentation. Selected Papers from International Symposia Presented by the Instrument Society of America. John W. Scales (ed.), Vol. 1, Pittsburgh, Pa., Instrument Society of America, 1972, p. 39-54. 5 refs. (Presented at the 17th National Symposium of the Analysis Instrumentation Division of the Instrument Society of America, April 19-22, 1971.)*

Ambient air sampling procedures are discussed, with the contention that ambient air standards based on 24 hr averages lead to air sampling programs that do not reflect accurate pollution levels and changes in the general level of pollution input. Ambient air standards based on sampling times sufficiently short to allow for reasonably steady meteorological conditions during the sample taking period are recommended as the alternative to 24 hr sampling. Short sequential sampling times, periodic rotation of sampling equipment from site to site, and pollution wheel correlation of the resultant data offer an accurate, economical, and revealing method for conducting ambient air work.

43820 **APTIC NO. 66775**

Ott, Wayne and David Mage

THE REPRESENTATIVES OF URBAN AIR MONITORING STATIONS WITH RESPECT TO CARBON MONOXIDE. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 379-394. 7 refs. (April 20-21.)*

The effect of traffic on carbon monoxide concentrations measured near streets is discussed. There is a high correlation between traffic volume and CO concentration. Carbon monoxide concentration decreases markedly as distance between the measuring location and traffic activity increases both in the horizontal and vertical directions. Since the official air monitoring stations vary greatly in height of probes and in horizontal proximity to traffic, air quality in different urban areas cannot be validly compared using existing data. A uniform air sampling height of 3 m and dual monitoring in which the background concentration and peak concentration are measured independently are recommended for a nationwide scale. (Author abstract modified)

43821 **APTIC NO. 66779**

Stephens, N. T. and L. W. Johnson

FIELD SAMPLING TECHNIQUES FOR AIRBORNE POLLUTANTS. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf. Proc., 2nd Annu. Meet., Louisville, Ky., 1972, p. 595-613. 4 refs. (April 20-21.)*

Simplified techniques for sampling and analysis in remote locations were developed for sulfur dioxide and particulate matter. While the techniques were utilized in aircraft mounted sampling programs, they may be as readily adapted to ground based mobile or fixed sampling programs. Plume tracking over great distances in short time periods clearly demonstrate the source concentration link necessary to establish precisely which source was contributing to the ground level concentrations being experienced by receptors. The procedures are applicable to many industrial and governmental programs where limited time and money are available for exhaustive surveys. The procedures give sufficiently accurate results for estimates of pollutant concentration and plume dispersion to assess the potential impact on an area or individual receptor, to assess the advisability of instituting control and abatement procedures, or to more clearly establish source receptor relationships.

43822 **APTIC NO. 66846**

Whitby, Kenneth T., Benjamin Y. H. Liu, Rudolf B. Husar, and Nicholas J. Barsic

THE MINNESOTA AEROSOL-ANALYZING SYSTEM USED IN THE LOS ANGELES SMOG PROJECT. *J. Colloid Interface Sci., 39(1):136-164, April 1972. 9 refs.*

The Minnesota aerosol analyzing system used in the Los Angeles smog project is described. The project includes an intensive 4 wk experiment period during which physical and chemical parameters of the aerosol were measured. A summary of the project including its genesis, objectives, and scope is presented. The instrument system, consisting of three aerosol sensors in parallel operation, was used to measure the aerosol size distribution from 0.0035 to 6.8 micron diameter automatically. The data were recording directly on punched tape for computer processing. The sensors used include a Condensation Nucleus Counter, a Whitby Aerosol Analyzer, and an optical particle counter. The experiments included: sampling of particulates for mass distribution and chemical analysis; chemical analysis of particulates; continuous gas analysis for nitric oxide, nitrogen dioxide, sulfur dioxide, ozone, peroxyacetyl nitrate, and hydrocarbons; turbidity measurements; effect of humidity on aerosol size distribution; smog making experiments; and LIDAR probing of automatic aerosols. Characteristics of the sensors, methods of calibration, and estimates of accuracies are included. (Author abstract modified)

43823 **APTIC NO. 67012**

Yocom, John E., W. A. Cote, and William L. Clink

MEASUREMENT OF AIR POLLUTANT PENETRATION INTO BUILDING INTERIORS. *In: Air Quality Instrumentation. Selected Papers from International Symposia Presented by the Instrument Society of America. John W. Scales (ed.), Vol. 1, Pittsburgh, Pa., Instrument Society of America, 1972, p. 75-88. 5 refs. (Presented at the 17th National Symposium of the Analysis Instrumentation Division of the Instrument Society of America, April 19-22, 1971.)*

A mobile instrument package for obtaining data on the quantitative relationships of indoor to outdoor air quality is described along with some typical findings generated by the study. Concentrations of total suspended particulate matter, soiling particulate matter, carbon monoxide and sulfur dioxide are measured both inside and outside air-conditioned and non-air-conditioned buildings in a downtown area. The mobile instrument package consists of four paper tape soiling samplers, a non-dispersive infrared CO analyzer, a conductimetric SO2 analyzer, and a glass fiber filter arrangement connected to a vacuum pump for collection of particulates to be weighed. The time history of CO in a gas-fired home is illustrated along with the effects of traffic flow on indoor levels of CO. An SO2 time history shows significant degradation in indoor air quality (as compared to outdoor) for a coal fired house with a leaky warm air furnace. Indoor dust concentrations are lower at night, in keeping with a lessening of human dust-disturbing activities during this period. The results indicate that multiplexing the sampling points permits precise comparison of air quality levels at different locations based on extremely small differences. Furthermore, sequential 5 min samples provide more than enough detail to show adequately the changes with time in relative indoor and outdoor concentrations of pollutants.

1971

43824 **APTIC NO. 67024**

Narayan, Raghu S., Raymond D. Steele, Richard L. Spore, Clarence J. Albus, Jr., Gordon C. Page, and Robert M. Bethea

CRITIQUE AND OPTIMIZATION OF THE AIR QUALITY MONITORING PROGRAM IN LUBBOCK, TEXAS. *Preprint, Texas Tech Univ., Lubbock, Dept. of Chemical Engineering, 48p., May 1971. 29 refs.*

A national air quality monitoring program in Lubbock, Texas is critiqued and suggestions for improvements are made. Specific recommendations center on the location of sampling sites based on the proximity of pollution sources and the effect of meteorological data on the site. Analytical techniques are described for the determination of hydrogen sulfide (methylene blue colorimetric method); carbon monoxide (continuous, automatic non-dispersive infrared absorption method); ozone (iodimetric techniques); particulates and aerosols (high volume air sampler); nitrogen oxides (the Saltzman method or absorbers and syringe methods); sulfur dioxide (West and Gaeke method or impingement and syringe methods); and total hydrocarbons (flame ionization detector).

1970

43825 **APTIC NO. 66802**

Tenny, H.

RAPID QUANTITATIVE ELECTRON MICROPROBE ANALYSIS OF PARTICLES. *Metallography, 3(4):399-405, 1970. 3 refs.*

Rapid quantitative analysis of particles was obtained by adding a cooled lithium-drifted silicon diode and a multichannel pulse-height analyzer to an electron microprobe. A Si diode with a resolution of 0.30 keV for the iron K(alpha) X-ray installed on the microprobe gave quantitative data for all elements heavier than sodium. The equipment layout and experimental procedure are described. With the diode, the emitted X-rays are counted nondispersively. The nondispersive method is much faster than the usual dispersive method. A nondispersive analysis can be accomplished in 5 min. The results obtained in the quantitative analysis of the particles by the two methods are described and compared. The samples studied included National Bureau of Standards steel spectropgraphic standards and stainless steel microspheres. (Author summary modified)

AIR QUALITY MEASUREMENTS

1974

43826 **APTIC NO. 66784**

Brosset, Cyrill, Kenth Andreasson, and Martin Ferm

THE NATURE AND POSSIBLE ORIGIN OF ACID PARTICLES OBSERVED AT THE SWEDISH WEST COAST. *Preprint, Swedish Water and Air Pollution Research Lab., Gothenburg (Sweden), 58p., July 1974. 8 refs.*

Particle content measurements of hydrogen ion, ammonium ion, and sulfate ion performed on air samples from the Swedish west coast reveal the presence of two types of acid particles. The ratio of protons to sulfate ion concentration is low for the first particle type. The hydrogen ion may be related to an acid phase also containing three ammonium constituents and two sulfate constituents or to some other acid phase which is found together with a diammonium sulfate phase. These phases are evidently generated by catalytic oxidation of sulfur dioxide absorbed in water droplets around the particles. The second type of acid particle has a hydrogen ion to sulfate ion concentration ratio which is sometimes close to unity, with the hydrogen ion being bound in an ammonium bisulfate phase. The particles are very small and may be formed in an atmosphere with a low concentration of ammonia by photochemical oxidation of SO2 in the presence of nitrogen dioxide. The mean value of the particleborne hydrogen ion concentration for the 6-month sampling period is 8 nmol/cu m, with maximum concentrations, measured as 6-hour mean values, being about 215 nmol/cu m. (Author summary modified)

43827 **APTIC NO. 66993**

Bruntz, S. M., W. S. Cleveland, T. E. Graedel, B. Kleiner, and J. L. Warner

OZONE CONCENTRATIONS IN NEW JERSEY AND NEW YORK: STATISTICAL ASSOCIATION WITH RELATED VARIABLES. *Science, 186(4160):257-259, Oct. 18, 1974. 10 refs.*

The concentrations of ozone at nine measurement sites in New Jersey and New York during the period from May 1 through Sept. 30, 1973 are examined. The distributions of the daily maxima of hourly mean O3 concentrations are summarized. Daily fluctuations in the O3 concentrations at any two sites were highly correlated. The concentrations were lower with low levels of solar radiation and with high wind speed. The average O3 concentration showed only minor differences between weekdays and weekends, despite markedly different traffic patterns. The Federal O3 standard was often exceeded at all the sites; the site that exceeded the standard most frequently was Ancora, the least urban. The regional character of the O3 patterns was evident in the high correlations between pairs of sites; these correlations tended to decrease with increasing intersite distance. (Author abstract modified)

43828 **APTIC NO. 66841**

Draftz, Ronald G. and Jack Durham

IDENTIFICATION AND SOURCES OF DENVER AEROSOL. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 36p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-263.)*

The city of Denver experiences some 283 atmospheric inversions each year which often produce substantial amounts of haze and a decrease in visibility. Late in 1971, a preliminary sampling and analysis survey of this problem was made to discover the cause and sources of atmospheric haze. Microscopical analysis of particles collected on hi-vol and impactor samples revealed that much of the aerosol consisted of road dust and automobile emissions; there were little or no contributions of aerosol particles from industrial sources. The techniques used to examine and identify the aerosol particles are described. These techniques can be applied to a wide variety of atmospheric aerosol investigations. Particle size and composition were determined in the Denver study. Particles were classified as quartz, limestone, mica, tire dust, automobile exhaust, coal fragments, fly ash, oil soot, iron oxides, magnetic metal, cornstarch, paper fibers, plant parts, and blue paint spheres. Membrane filters were analyzed for their mass elemental composition by optical emission and atomic absorption spectroscopy. (Author abstract modified)

43829 **APTIC NO. 66981**

Flemming, Guenther

MATHEMATICAL MAPPING OF THE SO2 IMMISSION IN THE DISTRICT COTTBUS. *(Rechnerische Kartierung der SO2-Immission im Bezirk Cottbus). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissions verminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 32-36. 7 refs.*

The district Cottbus has three areas with maximum sulfur dioxide immissions. The highest values of nearly 0.12 mg/cu m are reached in the area between Cottbus and Luebben. A second maximum with up to 0.08 mg/cu m lies southeast of Spremberg and a third with 0.07 mg/cu m northeast of Senftenberg. By 1975 the immission situation will deteriorate. In the area between Cottbus and Luebben the SO2 immission concentration will exceed 0.15 mg/cu m. The maximum with 0.20 mg/cu m will be in the industrial combine Black Pump. In the entire central and eastern part of the district Cottbus the immissions will rise. In the area Senftenberg the situation will improve due to a reduction of the emissions by the Lauchhammer combine.

43830 **APTIC NO. 66956**

Friedrichs, Karl Heinz, Arthur Brockhaus, and Herbert Steiger

DEVELOPMENT OF THE IMMISSION SITUATION IN NORTH RHINE WESTPHALIA USING SEVERAL MEASURING STATIONS AS EXAMPLE. *(Entwicklung der Immissionssituation in NRW am Beispiel mehrerer Messstationen). Text in German. Staub, Reinhaltung Luft, 34(9):326-329, Sept. 1974. 7 refs.*

Measurements of air pollution have been carried out since 1965 in Duisburg, Duesseldorf, Bochum, and a low-contaminated region of North Rhine Westphalia. Air pollution increased between 1965 and 1969 but has decreased in recent years. Data are given on lead and benzo(a)pyrene concentrations. Residents in the city are exposed to a fine dust load which is 2.5 times as high as in rural areas. The fine dust concentration was markedly higher in winter than in summer. The extent of the emission concentration depends on meteorological conditions. Stagnant air causes a tenfold rise of dust concentration over the median value. In the period November 1972 to July 1973 the lead concentration measured in Krahm (a rural village) was 0.15 micrograms/cu m, in Duesseldorf 0.42 micrograms/cu m and in Duisburg 5.91 micrograms/cu m. The half year (April to September) averages of benzo(a)pyrene concentration in the measurement period 1969 to 1973 were in Krahm 0.8, in Duesseldorf 6.4, and in Duisburg 23.3 ng/cu m, the October to March averages were 7.1 in Krahm, 56.8 in Duesseldorf and 130.7 ng/cu m in Duisburg.

43831 **APTIC NO. 66648**

Gorodinskiy, S. M., M. I. Vakar, G. A. Gaziyev, Y. Y. Sotnikov, and A. N. Mazin

HYGIENIC AND CHEMICAL INVESTIGATION OF THE HYDROCARBONS IN THE GAS MIXTURE IN ISOLATING PRESSURE CHAMBERS. *(Sanitarno-khimicheskoye issledovaniye uglevodorodnogo sostava gazovoy sredy izoliruyushchego snaryazheniya). Text in Russian. Gigiena i Sanit., no. 7:106-109, 1974. 6 refs.*

Hydrocarbons with 1 to 8 carbon atoms were investigated in the air in airtight sealed pressurized chambers such as flight imitators with persons working inside. Methane, ethane, ethylene, propane, butane, butylene, isopentane, pentane, unsaturated C5 isomers, isoprene, hexane, unsaturated C6, C7, and C8 fractions, heptane, octane, acetaldehyde, acetone, and ethanol were identified and determined quantitatively. Acetone, acetaldehyde, ethanol, and part of the hydrocarbons, such as methane, ethane, propane, and isoprene are intrinsic components of the exhaled air, while the other hydrocarbons are assumed to have been released by the construction materials of the airtight chamber. The hydrocarbon as well as acetone, acetaldehyde, and ethanol concentrations were well below the maximum allowable concentrations.

43832 **APTIC NO. 67176**

Graedel, T. E., B. Kleiner, and C. C. Patterson

MEASUREMENTS OF EXTREME CONCENTRATIONS OF TROPOSPHERIC HYDROGEN SULFIDE. *J. Geophys. Res., 79(30):4467-4473, Oct. 20, 1974. 20 refs.*

The ambient concentration of hydrogen sulfide, a species of significance both to gas phase tropospheric chemistry and to the interior chemistry of atmospheric aerosols, was measured over a 13-month period in a location representative of an extreme H2S environment. Peak concentrations exceeding 1 ppm (20-minute average) and long-term average values of 24 and 12 ppb (for two different source configurations) were measured at the Artesia Junction, New Mexico, site. Such levels exceeded nearly all known ambient values by factors of 10-20. The concentration data are represented (in different cases) by either Weibull or gamma distributions or by beta or log normal distributions; this finding contradicts previous suggestions of universal log normality in air pollution data and renders inappropriate the attempts to predict maximum concentrations by the imposition of unverified concentration distributions on limited quantities of data. Nearly all extremely high concentrations occurred between 1800 and 600 hours and were strongly associated with minimums in the local wind turbulence spectrum. The contaminant exposure diagrams and the concentration distributions that are presented constitute the first detailed determinations of ambient H2S concentrations. (Author abstract)

43833 **APTIC NO. 66968**

Hoffman, Eva J. and Robert A. Duce

THE ORGANIC CARBON CONTENT OF MARINE AEROSOLS COLLECTED ON BERMUDA. *J. Geophys. Res., 79(30):4474-4477, Oct. 20, 1974. 30 refs.*

The concentration of total organic carbon in marine aerosols collected from a 20-meter tower on the southwest coast of Bermuda ranged from 0.15 to 0.47 micrograms/cu m total suspended particulates under onshore wind concentrations. The mass of the organic carbon ranged from 1 to 19% of the mass of sea salt in the particles in Bermuda, and the percentage decreased with increasing salt content. (Author abstract)

43834 **APTIC NO. 66937**

Katsuhiko, Yamashita

THE DISTRIBUTION OF PUBLIC NUISANCE IN SAPPORO CITY. *(Sapporo-shi ni okeru toshi kogai no bunpu). Text in Japanese. Tohoku Chiri (Ann. Tohoku Geogr. Assoc.), 26(2):90-95, April 1974. 12 refs.*

The distribution of sulfur-containing air pollutants in the central portion of Sapporo and surrounding residential districts was studied. Analyses indicated that high concentrations of sulfur compounds in the air were more prevalent in the central business district, though some decrease was noted, probably as a result of the completion of a district central heating system in one part of the business area. Residential districts were also polluted with airborne sulfur compounds, though to a lesser extent. The installation of central heating adjacent the central business area and in residential districts is recommended.

43835 **APTIC NO. 66982**

Lehmann, Angela and Dieter Kahl

SO2 IMMISSIONS IN THE VICINITY OF THE LARGE POWER PLANTS IN NIEDERLAUSITZ - CALCULATION AND MEASUREMENTS. *(SO2 - Immission im Einflussbereich der Niederlausitzer Grosskraftwerke - Berechnung und messtechnische Erfassung). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 37-51. 4 refs.*

Sulfur dioxide immission measurements help to determine the actual pollution in a selected territory. By taking discontinuous short-term measurements expenditures (costs and personnel) remain tolerable. A measurement grid is placed around the emission source whose radius is usually 25 to 30 times the stack height. For chemical analysis of SO2 the pararosaniline method is used. The sampling timer per measuring station is 10 min. The value of these short-term measurements is enhanced by running continuous measurements at one or two stations in the grid. Systematic SO2 immission measurements in the vicinity of large power plants have been taken in the German Democratic Republic since 1969. In three grids with a total of 135 measuring points the measurement series have been completed. Two further measurement grids with about 120 measuring points are in preparation. The results of measurements in the vicinity of the power plant Luebbenau are briefly discussed. While the short-term immission concentration representing the 15-minute average remains in all grid squares below the maximum allowable immission concentration, the 24-hour average exceeds the maximum allowable immission concentration up to 1.32 fold in 50% of the cases. For the entire Eastern part of the Cottbus district the calculation of the prospective SO2 immission once the new power plant Jaenschwalde goes into operation was attempted. The calculation covered an area of 6300 sq km, three wind velocities (4, 8 and 12 m/sec) and eight wind directions. An illustration shows the immission distribution in 1985 in the area Cottbus at winds from the northwest. In areas of overlapping waste gas plumes from the power plants Luebbenau and Vetschau and on the leeward side of the power plant Boxberg the SO2 immissions will be above the maximum allowable SO2 limit value of 500 micrograms. A comparison of the calculated values with measured values reveals considerable differences. The calculated results yielded a higher SO2 immission concentration which was largely due to the inadequacy of the mathematical model used. A new one is therefore described.

43836 **APTIC NO. 66969**

Peirson, D. H., P. A. Cawse, and R. S. Cambray

CHEMICAL UNIFORMITY OF AIRBORNE PARTICULATE MATERIAL, AND A MARITIME EFFECT. *Nature (London), 251(5477):675-679, Oct. 25, 1974. 20 refs.*

Measurements of the trace element content of airborne dust, rainwater, and dry deposit, sampled at various places in Britain during 1972-1973, are discussed. The average concentrations in air of about 30 trace and other elements at seven sites in Britain, chosen to represent rural and more industrial, non- urban areas, are tabulated. Airborne particulate material had a uniform elemental composition, in which the industrial elements were enriched relative to the soil. On the surface of the North Sea, the trace element content seemed to be massively enhanced relative to bulk seawater. The most plausible explanation for the excess of trace elements in rain is that they arrived with the sea spray driven by wind from the ocean surface. The excess material on the ocean surface may be caused by deposition from the atmosphere or by the high concentration of material from within the sea. (Author abstract modified)

43837 **APTIC NO. 66623**

Segawa, Akira

PHOTOCHEMICAL SMOGS AND CYANIDE IN THE AIR. *(Kokagaku sumoggu to taikichu no shian). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(8):575-578, Aug. 1974. 3 refs.*

The air was sampled 16 times between July and Oct. 1973 on the campus of Hagoromo School in Takaishi, where photochemical smogs had caused some health damages two summers ago. A trace amount of cyanide was detected in some of the samples only during photochemical smogs. Although this fact alone does not prove any direct relationship between photochemical smogs and cyanides, the phenomenon was considered important enough for a report. The method of analysis was JIS K0109 and spectrophotometry. Samples were taken into polyvinyl chloride bags by an air pump and transferred to jars with 20, 30, or 40 ml of caustic soda solution absorbent. The photometry wavelength was 62 nm, the slit width 0.03 mm. The color agreed with the standard cyanide liquid. To check the stability of cyanides, 1.3 micrograms potassium cyanide solution in a jar was exposed to the air at the rate of 2 l/min for one hour, and KCN was measured again. It was confirmed that the method was stable and did not lose any significant amount of CN. The amount of hydrogen cyanide detected on Aug. 8-9, 11, and 13 ranged from 0.014 to 0.075 microgram/ml in the absorbent, and between 0.002 and 0.010 ppm in the air. On all these days, the maximum level of oxidant concentration was over 0.12 ppm. On the day of the highest HCN measurement (0.01 ppm) the oxidant measurement was also the highest of all sampling days, and was 0.15 ppm (Aug. 13, 2 pm).

43838 **APTIC NO. 66928**

Tanner, T. M., J. A. Young, and J. A. Cooper

MULTIELEMENT ANALYSIS OF ST. LOUIS AEROSOLS BY NONDESTRUCTIVE TECHNIQUES. *Chemosphere, 3(5):211-220, Oct. 1974. 9 refs.*

Aerosols in the St. Louis region were analyzed by neutron activation and X-ray fluorescence, with the data being used to infer the aerosol origin (natural versus anthropogenic). The X-ray fluorescence analysis system consisted of a high intensity X-ray emitting radioisotopic source and a silicon-lithium X-ray energy analyzer. Concentrations of the elements were determined by direct comparison of the sample X-ray counting rate with counting rate obtained from vacuum-deposited thin film standards. The neutron activation analysis involved irradiating the samples and standards for one minute at a neutron flux of 1.3 times 10 the 13 n/sq cm sec using a pneumatic delivery system; the samples were allowed to decay for 10 min and then counted on a germanium-lithium spectrometer for 5 min. Accuracy and precision for a single determination of the aerosol s elements was usually better than 10%. Data obtained from a study of the downwind transport and range of deposition for trace elements in the urban plume indicated that the elements arsenic, bromine, chlorine, copper, mercury, lead, sulfur, antimony, selenium, and possibly calcium and magnesium were enriched relative to a soil-derived component and therefore attributable to anthropogenic sources.

43839 **APTIC NO. 66634**

Toda, Kiyoshi

THE TOTAL AIR QUANTITY REGULATION IN YOKKAICHI. *(Yokkaichi ni okeru taiki soryo kisei). Text in Japanese. PPM (Japan), 5(9):34-43, Sept. 1974.*

A computer calculation was used for the environmental pollution analysis project in Yokkaichi to see whether the city s total emission quantity met the new total emission standards. The basic data was obtained from 241 plants (26 public baths) and 385 stacks (26 public baths, stacks) from the Yokkaichi area including Yokkaichi, Kusunoki-cho, Kawagoe-cho, and Asahi-cho. The installations were primarily users of fuel oil. The weather factors were obtained from the records of the Central Yokkaichi Weather Observation Bureau. The wind direction of NW-WNW which dominates 33.5% of the year and the average wind velocity of 3.5 m/sec were used. For the dispersion calculation, the annual average total emission measurement was used. Sulfur dioxide measurements by electroconductivity were expressed in ppm and PbO2 measurements were converted into ppm. The dispersion calculation was applied to 282 points, cross sections of lattice segments of 500 m mesh in the central area and 1000-2000 m mesh in the peripheral areas. The effective stack heights were obtained by the Holland equation. Dispersion calculation followed the Ito equation of the Japan Meteorological Agency. Parameters for the dispersion equation were obtained by referring constantly to actual measurements at 28 locations and finally a correlation coefficient of 0.82 was obtained. The dispersion parameters at five levels of stack heights ranged between 0.088 and 0.27.

43840 **APTIC NO. 67177**

Wood, C. M., N. Lee, J. A. Luker, and P. J. W. Saunders

THE GEOGRAPHY OF POLLUTION. A STUDY OF GREATER MANCHESTER. *Manchester (England), Manchester University Press, 1974, 160p. 165 refs.*

The spatial geographic relationships of pollution in Greater Manchester were studied. The spatial nature of the pollution problem is discussed, and the basic physical, socio- economic, and industrial characteristics of Greater Manchester are described. Various kinds of air, land, water, and noise pollution in the area are discussed. Air pollution emissions from registered works and road traffic and concentrations of road traffic pollutants, grit and dust, smoke, and sulfur dioxide are reviewed. The effects of air pollution on weather, human health, and plants are discussed. The variation in overall pollution levels between the various areas in Manchester is compared, and pollution in Manchester is compared with that in the North West region and in the country as a whole. The policy issues, including town planning, of wider significance to be drawn from the study, especially those relating to disadvantaged areas, are examined. The formal model of the pollution process and the statistical analysis of its constituent relationships in Greater Manchester are given in an Appendix.

43841 **APTIC NO. 66899**

CONTROL OF AIR AND WATER POLLUTION. SECTION 7: HEALTH. *(7. Sektie gezondheid. Bestrijding van de lucht- en waterverontreiniging). Text in Dutch. Ann. Mines Belg., no. 4:73-85, April 1974.*

Results of air and water pollutant concentration measurements conducted in Belgium are presented. The sulfur dioxide and smoke levels were measured by means of an acidity-smoke monitoring network, using a paper filter for smoke retention and a hydrogen peroxide solution for the determination of SO2. The SO2 concentrations were highest in the winter and lowest in the summer months. The sulfate ion concentrations in precipitation samples ranged from 22 to 75 mg/sq m per day, while the precipitation pH was in a range of 1.3-6.8. The dust fall rate was usually lowest during the winter months. The suspended dust concentration was between 0.115 and 0.392 mg/cu m.

43842 **APTIC NO. 67298**

Environmental Data Service, Asheville, N C., National Climatic Center

ATMOSPHERIC TURBIDITY AND PRECIPITATION CHEMISTRY DATA FOR THE WORLD 1972. *World Meteorological Organization/National Oceanic and Atmospheric Administration/Environmental Protection Agency Publication, 260p., Jan. 1974. 8 refs.*

A discussion of turbidity computations and a station index are presented. Stations are listed alphabetically within country; each station is listed with the latitude and longitude, and station elevation. Sufficient precipitation chemistry data for 1972 were not available. Atmospheric turbidity summaries are given for those stations from which the data were received too late for publication previously. The countries covered include the U. S., Sweden, United Kingdom, Ireland, Greenland, Spain, Portugal, Germany, Italy, Turkey, USSR, India, Taiwan, Korea, Japan, South Africa, Panama, Brazil, Antarctica, Pacific Islands, Australia, and Philippines.

1973

43843 APTIC NO. 67198

Aoyama, Taiki, Eiichi Ito, and Juji Takeuchi

INVESTIGATION OF THE ATMOSPHERIC POLLUTION WITH PCB IN A CITY. *(Toshi taikichu ni okeru PCB osen). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:23-26, 1973. 6 refs.*

Ambient air measurements of polychlorinated biphenyls for the urban Nagoya area are presented. A high volume air sampler was used for the sampling, with chemical analysis being performed by gas chromatography. The average concentration of PCBs recorded was 0.003 micrograms/cu m. The compounds are industrially used in the area under the trade names of Aroclor and Kaneclor and have been also found in foods and water.

43844 APTIC NO. 66890

Breeding, R. J., J. P. Lodge, Jr., J. B. Pate, D. C. Sheesley, H. B. Klonis, B. Fogle, J. A. Anderson, T. R. Englert, P. L. Haagenson, R. B. McBeth, A. L. Morris, R. Pogue, and A. F. Wartburg

BACKGROUND TRACE GAS CONCENTRATIONS IN THE CENTRAL UNITED STATES. *J. Geophys. Res., 78(30):7057-7064, Oct. 20, 1973. 26 refs.*

Concentrations of common trace gaseous constituents of the atmosphere were measured in clean air in rural Illinois and Missouri. Sulfur dioxide, nitrogen dioxide, ammonia, and aldehydes were removed from the air by 1 hr of wet scrubbing, while hydrogen sulfide was collected by passing air through an impregnated filter for 1 or 2 hrs. Background concentrations of SO2, NO2, and RCHO ranged from less than 1-5 ppb. The NH3 concentrations were as high as 10 ppb. The H2S concentrations varied from less than 0.10-0.35 ppb. Comparison of the data with previous measurements and with assumed worldwide values indicated that concentrations of NO2 and H2S assumed to exist over land at temperate latitudes may be too high. (Author abstract modified)

43845 APTIC NO. 66813

Jepsen, Anders F.

MEASUREMENTS OF MERCURY VAPOR IN THE ATMOSPHERE. *Advan. Chem. Ser., no. 123:81-95, 1973. 4 refs. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry Meeting 162nd, Washington, D. C., Sept. 15, 1971.)*

Mercury vapor measurements were made with an atomic absorption spectrophotometer specifically designed and built to isolate the 2536.5 Angstrom emission and absorption spectrum characteristic of atomic mercury to demonstrate that a portable detector such as the one used could detect anomalous concentrations of the metal s vapor in air near sites where Hg had been reported in water, sediment, and fish. A Barringer airborne Hg spectrometer was installed on cars, buses, boats, and helicopters; and measurement traverses were made to locate, quantify, and map the anomalous Hg plumes. The program resulted in locating several previously unreported sites of Hg contamination associated with natural deposits such as Hg mines and hot spring areas as well as cultural sources such as chemical plants, sewage treatment plants, and sanitary land fills. The largest Hg vapor level attributable to an industrial source was measured near the site of a chlor-alkali plant and downwind of a settling pond used by a large chemical plant. Some plume dispersal patterns were over residential and populated business areas. The measurements ranged from 0-28,000 nanograms/cu m. (Author abstract modified)

43846 APTIC NO. 66912

Tisone, G. C.

MEASUREMENTS OF NO DENSITIES DURING SUNRISE AT KAUAI. *J. Geophys. Res., 78(4):746-750, Feb. 1, 1973. 14 refs.*

Measurements of nitric oxide densities during sunrise over Kauai, Hawaii during May of 1971 were made by observing the resonant scattered sunlight from NO gamma bands in the 2000- 2200-Angstrom region in order to obtain information for more meaningful atmospheric models of NO densities. The absolute intensity of the zenith radiation in the region of the NO dayglow band at 2149 A was measured by a one-quarter meter scanning Ebert spectrometer, while a filter photometer with an interference filter whose peak transmission was at 2150 Angstroms measured the overhead emission. Direct solar radiation was measured as a function of altitude using two filter photometers with peak sensitivities at 2150 and 2500 A. The total spectrometer system and the total zenith photometer system were calibrated using a low-level diffuse light source whose surface brightness was measured using a calibrated photomultiplier. The total zenith emission rates for the NO emission in the (1.0) gamma band were less than previous measurements by 0.20-0.50, though the densities derived from the data in the altitude region of 70-100 km agreed in magnitude with previous measurements.

1972

43847 APTIC NO. 67025

Clemesha, B. R. and Y. Nakamura

DUST IN THE UPPER ATMOSPHERE. *Inst. de Pesquisas Espaciais, Sao Jose (Brazil), INPE-201-BI/002, 9p., May 1972. 2 refs.*

NTIS: N74-19028

Dust was measured in the upper atmosphere in Sao Jose, Brazil. During Oct. 1971, a large influx of dust was measured at heights above 30 km. Particle size was also determined. On the first day on which dust was observed, it was mostly concentrated in the height range 45-49 km, with a small secondary peak at 60 km. On subsequent days, the dust was distributed over a wider range of height. The average profiles for Sept., Oct. (excluding Oct. 19), Nov., Dec., and Jan. are presented. A general decrease occurred in excess scattering from Nov. to Jan. The minimum height at which dust was observed increased from about 35 km in Oct. and Nov. to 45 km in Jan., while the scattering above 70 km was hardly changed. It appeared that the dust was removed most rapidly from the lower part of the atmosphere and considerable vertical mixing occurred. The dominant transport effect appeared to be eddy diffusion rather than gravity, which invalidated calculations of the particle size from the rate of fall. The total amount of dust involved was estimated assuming a certain size distribution, refractive index, and density for the particles. On the basis of a world wide influx of dust, an estimate of the total mass of dust involved, assuming that it occurred over one hemisphere, was 10,000 tons.

43848 APTIC NO. 66727

McCurdy, Ross F. and Harold J. Paulus

PREDICTION OF HEAVY METALS IN SETTLEABLE PARTICULATES. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 12(2):184-191, 1972. 5 refs. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 164th, New York, Aug. 28-Sept. 1, 1972.)*

Dustfall samples were collected from eight stations in various locations around a steel plant in the Sydney, Nova Scotia area and analyzed for iron, manganese, and zinc by atomic absorption spectrometry in order to determine whether various statistical models could be applied to determine the statistical distribution of constituents in the samples. The data were checked for linear relationships using a least squares estimator, with dustfall residue as the independent variable and the ash, Fe, Mn, and Zn contents as the dependent variables. Ash or non-volatile content was predicted with certainty, while Fe content was also predicted with a high degree of probability. Models developed for both Mn and Zn were valuable mainly for determining approximate levels. The dustfall residue and ash content was predicted with certainty by analyzing only the Fe content and predicting the other contents. The models were developed to be applicable only to the Sydney area.

ATMOSPHERIC INTERACTION

1974

43849 **APTIC NO. 66906**

Adams, Charles N., Gilbert N. Plass, and George W. Kattawar

THE INFLUENCE OF OZONE AND AEROSOLS ON THE BRIGHTNESS AND COLOR OF THE TWILIGHT SKY. *J. Atmospheric Sci., 31(6):1662-1674, Sept. 1974. 10 refs.*

The influence of ozone and aerosols on the brightness and color of the twilight sky was investigated theoretically by calculating radiance and color for single scattered radiation with the use of spherically symmetric models of the earth s atmosphere. Spherical geometry was used throughout the calculations with no plane parallel approximations, and refraction effects were taken into account by fine subdivision of the atmosphere into spherical shells of fixed refraction index. Snell s law of refraction was used to calculate a new direction of travel each time that a photon traversed the interface between layers. The results indicated that molecular scattering alone does not explain the colors of the twilight sky. The addition of ozone absorption was essential to a model in order to reproduce the blue color of the zenith sky, with some purple colors of low spectral purity also being obtained. The deep blue of the zenith sky and the red and orange colors of high spectral purity in the region around the color horizon were obtained only when a realisitc model was used which combined molecular and aerosol scattering and ozone absorption.

43850 **APTIC NO. 66840**

Blumenthal, D. L., J. A. Anderson, and G. J. Sem

CHARACTERIZATION OF DENVER S URBAN PLUME USING AN INSTRUMENTED AIRCRAFT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-266.)*

An extensive three-dimensional air pollution mapping program was carried out in the Denver area during a 10-day period in mid-November 1973. An aircraft instrumented to continuously measure scattering coefficient, condensation nuclei, ozone, nitrogen oxides, carbon monoxide, sulfur dioxide, and flight parameters was used in the study. The aircraft was also equipped with instrumentation to measure the size distribution of grab samples. The sampling pattern was designed to study the characteristics of the fresh pollutants in the morning drainage wind and those of aged pollutants in the plume later in the day. The urban plume was sampled during inversion conditions when it was trapped in a shallow mixing layer and also during periods of good mixing and ventilation. The plume was well-defined and well-mixed. High pollutant concentrations were observed aloft in power plant plumes which were subsequently ventilated to the ground as the mixing layer deepened. Photochemical processes were important, and the O3 level in the plume varied from 0.00 to 0.08 ppm. The background level outside the plume was always measured at between 0.03 and 0.05 ppm. The aerosol size distribution also changed character as the plume aged. (Author abstract)

43851 **APTIC NO. 66688**

Brinkmann, W. L. F. and U. D. M Santos

THE EMISSION OF BIOGENIC HYDROGEN SULFIDE FROM AMAZONIAN FLOODPLAIN LAKES. *Tellus (Uppsala), 26(1-2):261-267, 1974. 4 refs.*

The vertical and seasonal distribution of hydrogen sulfide was studied in four central Amazonian floodplain lakes from Feb. 1970 to July 1971. The emission of H2S was detected mainly during the period of falling water of the Amazon river which peaks out in September and October. Hydrogen sulfide was present even in some surface water samples (up to 0.40 mg at. H2S-S/l). A part of the emitted H2S is recycled on a regional or local scale by means of biospheric trap mechanisms and eventual rainout, sustaining the tight sulfur cycle of the Amazonian tropics. A certain amount of the emitted H2S contributes to the S budget. Under cold front conditions the emitted H2S is rapidly recycled into the tropical forest stands. (Author abstract modified)

43852 **APTIC NO. 66796**

Cermak, J. E., D. J. Lombardi, and R. S. Thompson

APPLICATIONS OF PHYSICAL MODELING TO THE INVESTIGATIONS OF AIR POLLUTION PROBLEMS IN URBAN AREAS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 26p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-160.)*

Wind tunnel modeling of atmospheric flow and diffusion in the boundary layer over an urban area are discussed. Measurements were made over a model of an urban area composed of a network of uniform city blocks and streets. Two line sources emitting a radioactive tracer gas represented automobile emissions in a one-block length of a city street. Pollutant concentrations were calculated from samples of the tracer gas collected on building faces, in street canyons, and in the flow field above th model. Nondimensionalized concentration patterns were constructed from the analysis of the samples. Three wind directions were considered. The effects of a modification of the uniform model were evaluated. (Author abstract)

43853 **APTIC NO. 67019**

Fabrick, Allan J.

MATHEMATICAL MODELING OF REACTIVE POINT SOURCES. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1974. 4 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-120.)*

The evaluation of the impact of fossil fuel power plants requires a knowledge of the impact of emissions on local air quality. A new method for solving the turbulent atmospheric diffusion equations with photochemistry was developed. In the absence of chemical reactions, this method exactly reproduces the Gaussian solution. The impact of an idealized natural gas burning power plant on local air quality was investigated using this diffusion model. Preliminary reesults indicated that ground level nitrogen dioxide is dependent on the total nitrogen oxide emissions and not on the initial nitric oxide/nitrogen dioxide ratio. Ground level ozone concentrations were generally the same as NO2 (within a factor of two). In order to apply this method to the evaluation of coal and oil burning power plants, the photochemical mechanism must be extended to include sulfur dioxide and particulates. (Author abstract)

43854 **APTIC NO. 66876**

Fujiwara, M., M. Hirono, T. Itabe, and O. Uchino

OBSERVATIONS OF STRATOSPHERIC AEROSOLS BY TWO-WAVELENGTH LASER RADAR. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 112. (Sept. 3-6, Paper VII-2.)*

Optical probing of the upper atmosphere was carried out at Fukuoka, Japan, using lidar (laser radar) and the results of aerosol observations in the atmosphere are discussed. The layer of enhanced optical backscattering due to aerosols appeared every night throughout the period of observation at about 20 km. The layer, called the 20 km sulfate layer, varied to some extent in its height, structure, and peak value of scattering, day to day and month to month. Height profiles of non-Rayleigh backscattering cross-section were calculated for each night and month and compared with the temperature, wind velocity, and ozone concentration in the stratosphere. The individual nightly profile of scattering was most likely controlled by the large- scale structure of the temperature profile of the night. The geometrical cross-sections of the aerosols deduced from the small ion density data were also compared. A large fraction of the aerosol mass was probably involved in the range of Aitken particles.

43855 **APTIC NO. 66882**

Hirono, M.

ON THE DYNAMICAL BEHAVIOR OF THE DUST AND ITS VAPORIZED ELEMENTS IN THE UPPER ATMOSPHERE INFERRED FROM THE OBSERVATION BY LASER RADAR. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 170-172. 9 refs. (Sept. 3-6, Paper X-1.)*

Observations of scattered resonance lines and rocket-borne mass spectrometer measurements have indicated the presence of metallic atoms and ions in the upper atmosphere at a height of 80-120 km. A model has been proposed in which the metallic atoms are produced from ablating meteors, but it does not explain seasonal variations. Other models attributed the origin of seasonally varying sodium atoms to the presence of dust. A new interpretation is described for the height-distribution and seasonal variation of metallic atoms and ions from ablated meteorites considering Chimonas-Axford s corkscrew effect, the effect of vertical ion transport caused by seasonal zonal wind systems at 90-110 km, and the meridional ion transport caused by global atmospheric circulation above 110 km. Comparative experiments on stratospheric aerosols by laser radar (lidar) and other methods are discussed.

43856 **APTIC NO. 67179**

Idso, Sherwood B.

TORNADO OR DUST DEVIL: THE ENIGMA OF DESERT WHIRLWINDS. *Am. Scientist, 62(5):530-541, Sept.-Oct. 1974. 42 refs.*

The enigma of desert whirlwinds is reviewed in terms of possible mechanisms for their development, with typical mechanisms being illustrated for tornados and dust devils. Several mechanisms are cited that may induce concentrated, vortical wind motion in the vicinity of desert dust storm frontal boundaries, including the interaction of a thunderstorm s cold-air outflow with a topographic disturbance. The interaction at thunderstorm outflow boundaries involving the momentum of a strong convergent local wind field might also be an explanation for vortices as opposed to differential temperature-induced convection. Questions concerning vortices which remain unanswered involve: whether they occur in front of or behind the surge head and whether their rotation is cyclonic or anticyclonic, the possibility of a dynamic connection with the cloud base, the probability of vortex occurrence downwind from significant topographic disturbances, the frequency of twin funnels, and the frequency of small subsidiary vortices being associated with larger vortex wind fields.

43857 **APTIC NO. 66878**

Isono, K. and Y. Iwasaka

ON THE MEASUREMENT OF AEROSOL AND GROWING DROPLETS BY TWO-COLOR LIDAR. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos., Stud., Sendai, japan, 1974, p. 122-123. (Sept. 3-6, Paper VII-9.)*

The design of a two-color (1.06 and 0.694 micron) lidar is discussed for measurement of aerosol particles and the change of size distribution for growing droplets condensed o them in the troposphere and stratosphere. The characteristics of the lidar system used and the results of calculation of relative contributions of back-scattered power by scatters of each size range indicated to the total back-scattered power are discussed. The 0.694 micron light is more sensitive to particles in the 0.1-0.4 micron size range, whereas the 1.06 micron light is sensitive to particles in the largest size range.

43858 **APTIC NO. 66849**

Joatton, R. and J. F. Leach

FIRST RESULTS OF ENVIRONMENTAL TESTS ON BOARD CONCORDE 001. *Acta Astronaut., 1(1-2):225-235, Jan.-Feb. 1974. 12 refs.*

The organizations that have been set up to coordinate stratospheric research in France and England are reviewed. The group in England is the Committee on the Meteorological Effects of Stratospheric Aircraft (COMESA), and its counterpart in France is Consequences des Vols Stratospheriques (COVOS). The reasons behind the choice of the measurement methods employed by the research institutions, the various experiments on the Concorde Prototype 001, and the calculations undertaken to determine the correct flight path for the aircraft while observing the sun for experiments involving solar absorption spectra, are described. Where possible, preliminary information is given on the results that have been obtained so far. Experiments were carried out using spectrometers working in both the near and far infrared. Twelve flights of the Concorde Prototype 001 took place. The results showed extreme variability of the values of mixing ratio for species such as nitric oxide and nitrogen dioxide, which suggests that NOx in the stratosphere may vary markedly with time of day, time of year, and altitude, perhaps more sharply than ozone. If this is true, then in order to establish an accurate picture of the effect of supersonic aircraft on the stratosphere, a program of NOx measurement must be set up that is far more extensive and coherent than present research. (Author abstract modified)

43859 **APTIC NO. 66957**

Junge, C. E.

RESIDENCE TIME AND VARIABILITY OF TROPOSPHERIC TRACE GASES. *Tellus (Uppsala), 26(4):877-888, 1974. 33 refs.*

The variability of trace gases is demonstrated as a useful parameter to derive information on the residence time. Only the tropospheric residence times are considered. On the basis of theoretical considerations, it is shown that time and space variations for tropospheric constituents should be approximately inversely proportional to their tropospheric residence time if the distribution of sources and sinks is similar. Compilation of available data seem to verify this. Such a relationship, if confirmed by further data, is a useful tool for atmospheric chemistry. (Author abstract modified)

43860 **APTIC NO. 66679**

Kaya, Yoichi and Yutaka Suzuki

GLOBAL CONSTRAINTS AND A NEW VISION FOR DEVELOPMENT--I. *Technol. Forecasting Social Change, 6(3):277-297, 1974. 15 refs.*

The effect of carbon dioxide gas from the burning of fossil fuels on the earth s atmosphere is discussed. Carbon dioxide gas and water vapor contribute most to the greenhouse effect or the warm atmosphere surrounding the earth. Even a small increase in the amount of CO2 can cause the temperature of the atmosphere to rise. Between 1958 and 1969 CO2 gas in the atmosphere has been steadily increasing by 0.2% a year primarily due to the combustion of fossil fuel. Half of the CO2 from fossil fuel combustion is reabsorbed by the sea and by vegetation; the other half accumulates in the atmosphere. By the year 2000 CO2 will have increased 27.2% over the 1970 level; by the year 2030 it will become three times that level. The CO2 thrown off by burning forests for food will increase the CO2 concentration of the atmosphere by 13.5%. If this occurs before the year 2000 when fossil fuel combustion will increase the CO2 concentration in the atmosphere by 27.2%, the overall concentration will increase by about 43%.

43861 **APTIC NO. 66873**

Kondratjev, K. Y., O. B. Vasilev, V. S. Grishechkin, L. S. Ivlev, M. A. Prokofjev, and L. I. Chapursky

SPECTRAL SHORTWAVE RADIATIVE FLUX DIVERGENCE IN THE TROPOSPHERE AND ITS POSSIBLE VARIABILITY. *(Spektral nyye korotkovolnovyye luchistyye pritoki tepla v troposfere i ikh vozmozhnaya izmenchivost). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 10(5):493-503, May 1974. 10 refs.*

Spectral radiative fluxes (in the interval of 0.4-2.4 micron), radiative balance, and the radiative flux divergence in the free atmosphere (at heights of 0.3-8.4 km) were measured from instrumented aircraft over sand surface during an atmospheric energetics experiment. Aerosol measurements were made simultaneously for the purpose of investigating, from the standpoint of physics, peculiarities of optical observations. Aerosol absorption of shortwave radiation in the troposphere was interpreted, and the possible variability of aerosol absorption was estimated from measurements performed on other days.

43862 **APTIC NO. 66971**

Kondratyev, K. Y. and O. I. Smoktiy

INFLUENCE OF AEROSOLS ON THE RADIATIVE HEAT INPUT INTO THE ATMOSPHERE. *Bull. Acad. Sci. (USSR), Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk, SSSR, Fiz. Atmosfery i Okeana), 10(2):115-119, Dec. 1974. 7 refs.*

A theoretical model of the transformation of unpolarized solar radiation by a partially reflecting surface and an overlying molecular atmosphere in which absorbing and scattering aerosol particles are present is discussed. Aerosol effects on the spectral transfer function and spectral albedo are determined. Calculated results are presented for the monochromatic radiative heat input and its variations through the entire thickness of an absorbing and scattering aerosol atmosphere as functions of the underlying surface albedo, the probability of photon survival in an elementary scattering event, the atmospheric scattering function, and the sun s zenith distance. Calculated data is compared with previous experimental results.

43863 **APTIC NO. 67226**

Kuehne, Rudolf, Helmut Diery, Rolf Rehberg, and Heinrich Hamal

METHOD OF AND AGENTS FOR INFLUENCING WEATHER. *(Farbwerke Hoeschst Aktiengesellschaft vormals Meister Lucius and Bruning, Frankfurt (West Germany)) U. S. Pat. 3,802,624. 10p., April 9, 1974. 11 refs. (Appl. Dec. 18, 1972, 11 claims).*

A method for reducing or removing the denseness of clouds and fog using polyfunctional alcohols is described. The alcohols are sprayed into fog or clouds in a finely dispersed form, having particle sizes of from 1-100 micron and preferably from 10-50 micron. The polyfunctional alcohols may be used, optionally, together with other fog and cloud dispelling agents. Preferred solid compounds for use in the process are the sugar alcohols, saccharides, and polyvinyl alcohol; alkane-diols, alkane-triols, or polyols and their reaction products with oxalkylating agents may also be used as liquid compounds or compounds with a low melting point. (Author abstract modified)

43864 **APTIC NO. 66603**

Lomaya, O. V.

AT ATTEMPT AT USING THE STATISTICAL METHOD OF METEOROLOGICAL FORECASTING OF URBAN AIR POLLUTION. *(Opyt ispol zovaniya statisticheskikh metodov dlya prognoza zagryazneniya gorodskogo zovdukha). Text in Russian. Soobsch Akad Nauk Gruz SSR, 75(1):81-84, 1974. 4 refs.*

A simple and reliable method for routine pollutant forecasting by multiple graphic regression is described. The graphic regression analysis is based on a standardized, seasonally adjusted daily concentration for a given place in an urban area. The pollutant concentration measured on the previous day, the mean wind velocity, the mean temperature gradient in the lower 1 km-layer of the atmosphere, and the daily amount of precipitation are used as predictors for the forecast. An independent verification revealed 100% accuracy of the prediction of 100% and 0% probabilities of pollution levels exceeding the limit value.

43865 **APTIC NO. 66897**

Luebs, R. E., K. R. Davis, and A. E. Laag

DIURNAL FLUCTUATION AND MOVEMENT OF ATMOSPHERIC AMMONIA AND RELATED GASES FROM DAIRIES. *J. Environ. Quality, 3(3):265-269, July-Sept. 1974. 15 refs.*

Simultaneous 24 hr air sampling at 0.8 and 11.2 km upwind from the nearest cows in a large dairy area showed distillable nitrogen, mostly as ammonia, at concentrations of 190 and 6 micrograms/cu m, respectively. An average distillable N concentration of 540 micrograms/cu m was measured during a 24 hr sampling at the downwind corral fence of an isolated 600 cow dairy. The data indicated significant N loss from dairy waste by NH3 volatilization, with meteorological factors greatly affecting the atmospheric concentrations of distillable N. Diurnal fluctuations with low concentrations in the afternoon and high concentrations at night were frequently recorded in the large dairy area, with higher nighttime concentrations being related to temperature inversions in the atmosphere. Close proximity to the source and a high horizontal flux of distillable N with afternoon winds were important factors in a reversed diurnal pattern observed at an isolated dairy site where high afternoon and low nighttime concentrations were recorded. (Author abstract modified)

43866 **APTIC NO. 66952**

Murata, Motohide, Masahito Komoto, Hozumi Tamura, Hirohisa Shima, Yoshihisa Nagai, and Yoshimasa Kaizu

CALCULATION OF NITROGEN OXIDES POLLUTION LONG-TERM AVERAGES BY A DISPERSION MODEL. *(Kakusan keisanho ni yoru chisso sankabutsu no osen choki heikinchi no suitei ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center Annu. Rep.), no. 2:31-36, March 1974. 12 refs.*

Coefficients for Yokkaichi s mobile and fixed sources of nitrogen oxides emissions were calculated after careful and repeated studies. Based on the results, a computer simulation of NOx dispersion calculation was attempted, and the result seemed satisfactory. The amount of NOx was regarded totally as nitrogen dioxide, the emission quantity from each stack was calculated, and the mean NO2 emission quantity was obtained. There are 291 plants, 674 facilities, and 564 stacks in Yokkaichi. The weather factors and the environmental pollution concentrations were taken into consideration. The effective stack height was obtained by the Holland equation. The dispersion calculation equation for NOx was obtained by the

Sutton equation. For mobile sources, dispersion from the aa source of 1 sq km was calculated with a modified equation of Ito s long-term mean figure equation. The results were satisfactory. Further studies must be made on the NOx in photochemical reactions, the ratio of NO2 to the total NOx concentration in the air, the comparison of calculated and actual figures, dispersion parameters, and a superior dispersion equation.

43867 **APTIC NO. 66879**

Naito, K., K. Takahashi, I. Tabata, Y. Yokota, T. Ikeno, H. Ito, I. Yamashita, and T. Hosokawa

LIDAR OBSERVATION OF STACK PLUME. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 144-146. (Sept. 3-6, Paper VIII-7.)*

A PPI-RHI lidar capable of quick scanning is more desirable than an A-scope lidar for observation of the smoke plume from a high stack. A few examples of analyses using a PPI-RHI lidar are given. Since the instantaneous cross-section of a plume is very irregular, with a clear boundary on the whole, the spatial running average was used for smoothing the cross-section along the distance downwind. The concentration distribution of smoke was thus obtained both in the crosswind and in the vertical direction at various distances. The coordinate of plume axis and plume width are given by the concentration distribution. The wave pattern of the plume is often significant as seen from the variation of the coordinate of thy plume axis; the smoke dispersion is generally caused by both turbulence and meander of flow. Smoke flow is influenced by terrain, even if the stack is high above the ground.

43868 **APTIC NO. 67192**

Nomoto, Shinichi

GEOGRAPHIC DISTRIBUTION OF SURFACE VISIBILITY. *(Niho ni okeru shitei no bunpu ni kansuru tokeiteki kenkyu). Text in Japanese. Kishocho Gijutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:124-136, Feb. 1974. 28 refs.*

The geographic distribution of surface visibility for the Japanese islands was studied at 72 weather stations from March 1966 to February 1968, with visibility values in kilometers being translated into three categories: good (better than the normal for a given station and given season), moderate, and poor. The Japanese islands were geographically divided according to these visibility categories into four major regions, with the visibility categories depending strongly on the surface pressure pattern. Though the Japan Sea coast areas and the Pacific coast areas generally belonged to different categories on a given day, large cities on the Japan Sea coast often represented categories similar to those in the Pacific coast areas. Multiple regression equations derived by a screening procedure indicated that the occurrence of poor visibility was associated with low temperature, high humidity, industrial activities, large undulation in topography, high altitude, and inland regions.

43869 **APTIC NO. 66706**

Peloso, A., G. Fumarola, and G. Ferraiolo

OPTIMIZATION OF THE DISPERSION OF COLD INDUSTRIAL STACK GASES. *(Progettazione ottimale dei sistemi di dispersione per fumi industriali freddi). Text in Italian. Riv. Combust., 28(6):221-229, June 1974. 22 refs.*

Natural and forced draught systems were investigated for the dispersion of cold industrial stack gases. The total cost of dispersion obtained by heating and pumping were compared on the basis of a graphic analytical procedure for the optimum distribution of the effective height of emission in terms of the geometrical height of the chimney and of the elevation of the chimney plume. The procedure was generalized to cover the case of gaseous effluents with fairly high thermal content. The mechanical solution is more convenient than the thermal one from both the economic and the ecological viewpoints.

43870 **APTIC NO. 66620**

Roffman, Amiram and Lowell D. Van Vleck

THE STATE-OF-THE-ART OF MEASURING AND PREDICTING COOLING TOWER DRIFT AND ITS DEPOSITION. *J. Air Pollution Control Assoc., 24(9):855-859, Sept. 1974. 22 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 66th, Chicago, Ill., June 1973, Paper 73-140.)*

One of the key elements in estimating environmental effects associated with the deposition of airborne chemicals and, in particular, salt particles from cooling towers, is drift rate. Eight different methods are currently employed to determine the drift rate from cooling towers. The difficulties associated with the various techniques vary, but they are mainly associated with collecting a representative sample, maintaining undisturbed air flow, determining the sampling collection efficiency, and analyzing the samples for particle size. Several approaches have been used to predict the deposition of salt water drift droplets on ground surfaces. Some use a simple analogy with the deposition of industrial dust, others use a combination of plume rise theories in conjunction with the Gaussian diffusion model to predict the air concentration of water droplets from which thhe ground deposition is then calculated. Other methods calculate the trajectories of the drift droplets accounting for their evaporation or employ diffusion type equations. Estimates derived from the various models used to predict drift deposition appear to vary by a factor of + or - 10 from each other. In contrast to the fast development in drift loss measurements, very few attempts have been made to measure actual drift deposition from fresh and salt water cooling towers and to compare experimental results with numerical models. The state-of-the-art of measuring and computing drift losses is discussed. Drift rate values, droplet size distribution, and some typical measured and calculated ground deposition values are discussed. (Author abstract)

43871 **APTIC NO. 66607**

Romberg, G.

INFLUENCE OF CHEMICAL REACTIONS ON THE TURBULENT DISPERSION OF POLLUTANTS IN THE ATMOSPHERE. *(Einfluss chemischer Reaktionen auf die turbulente Dispersion von Schmutzstoffen in der Atmosphaere). Text in German. Int. J. Heat Mass Transfer, 17(10):1163-1179, Oct. 1974. 18 refs.*

The dispersion of reactive pollutants in the atmosphere is treated from the viewpoint of chemical engineering. The ratio influence factor, formed from the average densities of a pollutant for the cases with and without chemical reactions, is determined as a thermodynamic function of average temperature and average density. Theoretical principles of influencing environmental pollution by the initiation of chemical reactions in the emission to obtain environmentally harmless components are discussed. In practice, this method of pollution abatement is applied in the form of thermal or catalytic afterburning of waste gases, especially malodorous hydrocarbons prior to discharge into the atmosphere.

43872 **APTIC NO. 67175**

Sellers, William D.

A REASSESSMENT OF THE EFFECT OF CO2 VARIATIONS ON A SIMPLE GLOBAL CLIMATIC MODEL. *J. Appl. Meteorol., 13(7):831-833, Oct. 1974. 5 refs.*

A simple global climatic model described earlier is modified slightly and reapplied to the carbon dioxide problem. The modifications include using a more efficient numerical method to solve the system of equations and changing the expression used to estimate the infrared emissivity of an atmospheric column. After runs of 300 model years, considered the period necessary to reach a true steady state because of the large heat capacity of the oceans, the average global surface temperature drops 1.64 C if the amount of CO2 in the atmosphere is halved and rises 1.32 C if the amount is doubled. The future of this type of modeling experiment and future improvements are described. (Author abstract)

43873 **APTIC NO. 66661**

Shimazaki, Tatsuo

STRATOSPHERIC OZONE AND SST. *(Seisoken ozon to SST). Text in Japanese. Nippon Butsuri Gakkaishi (Proc. Phys. Soc. Japan), 29(9):751-761, Sept. 1974. 5 refs.*

Ozone in the stratosphere absorbs ultraviolet rays and thereby protects living creatures from exposure to dangerous levels of ultraviolet radiation. The delicate balance of nature is now endangered by the flight of the SST in the stratosphere. The physical, chemical, geophysical, and engineering studies on the stratosphere and O3 are systematically reviewed. The structure of the atmosphere, vertical temperature distribution, historical background of the discovery of O3 in the stratosphere, and the method and result of O3 measurement in the ozonosphere are discussed. A theoretical analysis of the ozonosphere is made by means of the pure oxygen atmospheric model. The effect of hydrogen-oxygen compounds (HOx) on the O3 density obtained by theoretical equations is discussed. The role of nitric acid and nitrogen pentoxide in the stratosphere, the measurement method of nitrogen oxides, and atmospheric motion in the stratosphere are described. To investigate the effect of the SST on the stratospheric O3 density, various models have been developed, however, none of them is adequate to give accurate predictions. The present status of such theoretical models is reviewed.

43874 **APTIC NO. 66872**

Sonobe, Mitaka

INVESTIGATIONS FOR AIR POLLUTION FORECASTING (REPORT NO. 2) PHOTOCHEMICAL SMOG PREDICTIONS FOR YOKKAICHI. *(Taiki osen yoho chosa (dai 2ho) Yokkaichi no kokaguku sumoggu no yoso). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dis. Meteorol. Obs.), no. 7, p. 242-243, Sept. 1974.*

The relationship between oxidant concentration and Richardson number, which is used as an indication of meteorological conditions such as horizontal wind diffusion and atmospheric stability, was investigated. Mean oxidant concentration was obtained at 7 locations from 9 am to 6 pm in July and August 1972. Highest daily concentration can be estimated from an equation derived by the linear recurrence method. An equation for estimating mean oxidants concentration from horizontal wind diffusion was also derived from 55 examples excluding those of bad weather. Three equations were derived for the relationship between mean oxidant concentration and atmospheric stability, one for SW-W-N wind, one for NE-E-S wind and one for general cases.

43875 **APTIC NO. 66738**

Stensland, G. J.

FURTHER NUMERICAL MODEL STUDIES OF THE WASHOUT OF HYGROSCOPIC PARTICLES IN THE ATMOSPHERE. *Calif. Univ., Livermore, Lawrence Livermore Lab., Atomic Energy Commission Contract W-7405-Eng-48, 23p., July 2, 1974. 18 refs.*

NTIS: UCRL-51614

Numerical model methods are used to study rainout and washout of hygroscopic particles in the atmosphere, with the variation in concentration of hygroscopic material in rain water being investigated as a function of raindrop size class, changing radius of released particles due to drop evaporation, and time from initiation of rainfall. Increasing the number of raindrop classes from 12 to 44 and the number of layers from 5 to 10 has no appreciable effect on the rainwater concentrations predicted. An adequate depiction of the profile of released particles does, however, require the larger number of classes in order that at least one raindrop class evaporates in each layer near the ground. Changing the radius of the released particles from 1 micron to 15 micron causes maximum variations of about 15% in the predicted average rainwater concentrations. Removal of the time lag effect for such models produces very large errors in predicting the atmospheric aerosol profile during scavenging, with the errors being smaller for small rainfalls.

43876 **APTIC NO. 66871**

Sugiura, Shigeru

ON PARABOLIC REGRESSION EQUATIONS FOR THE FORECASTING OF MAX MIXING DEPTH AT TOKYO. *(Saidai kongoso kodo yoso no tame no niji kyokusen ni tsuite). Text in Japanese. Kishocho Gikutsu Shiryo: Taiki Osen Kisho Yoho Shiryo (Air Pollut. Weather Forecasting Data), no. 15:104-115, Feb. 1974.*

Parabolic regression equations were derived statistically from maximum mixing depths and the relationship of the temperature difference between daily maximum temperature (TM) and the temperature at 850 mb and the temperature difference between TM and the temperature calculated from the depth thickness corresponding to 900-700 mb. The data used for the study were those collected from 1965 to 1970. The regression, second order equations, correlation coefficients, and a limit of 90% reliability were obtained. On clear days in September and October, the temperature difference between TM and the temperature at 850 mb increased and the maximum mixing depth decreased. In December, when sunshine is weak, the maximum mixing depth decreased, but during June and August, it increased. The existence of an inversion layer caused the deviation of the conditioned curve from the regression second order curve.

43877 **APTIC NO. 66689**

Syrota, Jean and Francois Gourdon

THE OECD PROGRAM: LONG-DISTANCE TRANSPORT OF AIR POLLUTANTS. *(Le Programme OCDE Transport de Polluants Atmospheriques a de longues distances). Text in French. Pollut. Atmos. (Paris), 16(62):169-178, April-June 1974.*

The Long-Range Transport of Air Pollutants Program initiated by OECD for the study of the possible contribution of sulfur dioxide emissions from other parts of Europe to the SO2 and sulfate load as well as to the acidification of soil and water bodies in Scandinavia in general and in Sweden in particular is described. West Germany, Austria, Belgium, Denmark, Finland, France, Great Britain, Norway, the Netherlands, Sweden, and Switzerland are participating in the program that is to run until at least 1975. A total of 80 sampling stations have been envisaged for systematic measurements of the total sulfur content in particulate matter, the SO2 concentrations, the total sulfate content in precipitation, and the acidity of the precipitation. In addition, SO2 concentrations and temperature gradients are measured by aircraft. The SO2 load over Scandinavia is believed to originate from Great Britain, the Ruhr district, the Netherlands, Belgium, France, East Germany, Czechoslovakia and Poland, and possibly from North Italy and the Leningrad region. The preliminary results indicate non-negligible contribution of precipitation to the acid fallout at certain wind directions.

43878 **APTIC NO. 66675**

Takatsuka, Miwa, Norihito Miyamura, and Shigeru Igarashi

THE RELATIONSHIP BETWEEN OXIDANT CONCENTRATION AND TEMPERATURE- HUMIDITY IN PHOTOCHEMICAL SMOGS. *(Kokagaku sumogguji ni okeru okishidanto nodo to kion, shitsudo no kankei ni tsuite). Text in Japanese. Mie-ken Kogai Senta Nenpo (Mie Prefect. Pub. Nuisance Center), no. 2:58-60, March 1974. 9 refs.*

In July and August 1973, the correlation between oxidants and the temperature and humidity was studied on days of high oxidant concentrations. The temperature and humidity were measured by the Asman hygro-thermometer and oxidants were measured by neutral potassium iodide at the same locations. With a certain amount of variation, a relationship of correlation coefficient + 0.6575 (n equals 117) was recognized and when the temperature was over 30 C, oxidant increased suddenly. There was no correlation between humidity and the oxidant concentration. As a general tendency, oxidant concentration decreased with the increase of humidity. When the humidity was higher than 90%, there was no case of high oxidant concentration. This agreed with previous reports. According to the reports, photochemical smog had occurred in Tokyo when the temperature was as low as 17 C or 20 C. However, 80% of more than 0.1 ppm oxidant occurrences are within the temperature range of 24 and 33 C, and about 80% of more than 0.1 ppm oxidant concentration occurred in the 45-46% humidity range, taken between 11 am and 3 pm. These reports were not confirmed by this investigation.

43879 **APTIC NO. 66877**

Uchino, O. and M. Hirono

ON STRATOSPHERIC AEROSOL SIZE DISTRIBUTIONS FROM RECENT OPTICAL RADAR OBSERVATIONS. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 113-114. (Sept. 3-6, Paper VII-3.)*

Typical contemplated stratospheric aerosol size distributions proposed include Junge s size distribution, log-normal size distribution, bimodal size distribution. Laser radar (lidar) observations were carried out at Fukuoka, Japan, and small ion density was observed at Kagoshima, 200 km from Fukuoka, to determine whether observations of lidar backscattering and small ion density are explained by these size distributions. If the refractive index of aerosols is assumed to be 1.5, conditions for aerosol size distributions to explain both observations are: it is necessary that the minimum radius of the aerosol is smaller than 0.02 micron for nu less than or equal to 4 when Junge s size distribution is assumed; the log-normal size distribution is inadequate; and the bimodal size distribution can be determined by taking large and small particle number densities appropriately. These conditions cannot be used to determine aerosol size distribution uniquely. The bimodal size distribution is discussed in some detail considering the elementary physical processes.

43880 **APTIC NO. 66842**

Van Valin, Charles C., Rudolf F. Pueschel, Farn P. Parungo, and Richard A. Proulx

ANTHROPOGENIC CONTRIBUTION TO METEOROLOGICALLY IMPORTANT AEROSOLS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 22p., 1974. 15 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-268.)*

Measurements of aerosol characteristics, i.e., light scattering, Aitken nuclei, cloud condensation nuclei, ice nuclei, and chemical composition of individual particles, were made during the brown cloud experiment in the vicinity of Denver, Colo., in Nov. 1973. Well-defined pollution episodes were measured on Nov. 14 and Nov. 21, 1973, with several less distinct pollution episodes being noted at the sampling locations. Light scattering and atmospheric concentration of cloud condensation nuclei were directly and positively correlated with pollution intensity. Aitken nuclei concentration and air pollution intensity were usually correlated, but insolation intensity and aerosol aging were primary factors in particle surface modification and promotion of coagulation. Natural production of ice nuclei during windy periods greatly exceeded production during pollution episodes. The fraction of aerosol particles containing lead increased during pollution episodes. Lead, chlorine, and bromine were found mostly in particles less than 0.5 micron in diameter, which might coagulate with larger, predominantly siliceous particles. Thus, cloud condensation nuclei will be significantly elevated in a direction downwind of urban areas. One possible consequence could be a rain shadow downwind of cities subject to warm rain conditions. Lead halides, and probably most unburned hydrocarbon fractions, are efficiently removed through agglomeration with large particles having high settling rates. However, the coagulation of trace gases or small particles with siliceous giant particles increases the hygroscopicity of the latter through increased surface capillarity and/or solubility. (Author abstract)

43881 **APTIC NO. 66970**

Voloshchuk, V. M. and T. A. Muydinova

WASHOUT OF FINE AEROSOL PARTICLES FROM THE ATMOSPHERE. *Bull. Acad. Sci. (USSR), Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana), 10(1):23-28, Jan. 1974.*

The washing of fine aerosol particles out of the atmosphere is analyzed theoretically. The behavior of the coefficient of capture of the aerosol particles by cloud droplets and raindrops is investigated in the ranges of purely Brownian and inertial deposition at medium Reynolds numbers, and the effects of impingement and gravity in the range of the washout minimum are discussed. (Author abstract)

43882 **APTIC NO. 67197**

Yamamoto, G., M. Tanaka, and S. Ohta

HEATING OF THE LOWER TROPHOSPHERE DUE TO ABSORPTION OF THE VISIBLE SOLAR RADIATION BY AEROSOLS. *J. Meteorol. Soc. (Japan), 52(1): 61-68, Feb. 1974. 9 refs.*

The vertical distribution of the heating rate of the lower troposphere due to absorption of the visible solar radiation by aerosols was studied by solving the equation of radiative transfer in turbid atmospheres. Realistic model atmospheres with respect to size and vertical distributions of aerosols as well as surface reflectivity were assumed; and the latitude-altitude variation of the heating rate was calculated as a function of atmospheric turibidity and complex refractive index of aerosols. The heating rate appeared to increase in the lower atmosphere of the low latitude region and became comparable to the heating rate due to absorption of near infrared solar radiation by gaseous constituents there. The heating rate, however, appeared greatly affected by the imaginary part of the refractive index of aerosols. Determination of the imaginary part from yield observations utilizing an airplane or balloon was suggested.

1973

43883 **APTIC NO. 67359**

Chang, J. S., A. C. Hindmarsh, and N. K. Madsen

SIMULATION OF CHEMICAL KINETICS TRANSPORT IN THE STRATOSPHERE. *California Univ., Livermore, Lawrence Radiation Lab., Atomic Energy Contract and supported by Dept. of Transportation Climatic Impact Assessment Program, 17p., Oct. 1973. 21 refs. (Presented at the Symposium on Stiff Differentials System, Wildbad, West Germany, Oct. 4-5, 1973.)*

NTIS: UCRL-74823, Conf-731043-1

Simulations of chemical kinetics transport in the stratosphere require the use of a large system of stiff partial differential equations. The basic concept of the method of lines was used to reduce this system to a much larger system of ordinary differential equations, and then a solution technique based on the method of Gear was used to construct a program for carrying out such simulations. The motivation, effectiveness, and limitations of this solution technique are discussed. An application of the simulation technique to the problem of the pollution of the atmosphere from supersonic transports and the effects of atmospheric nuclear tests and ozone is described.

43884 **APTIC NO. 66910**

Delany, A. C., W. H. Pollock, and J. P. Shedlovsky

TROPOSPHERIC AEROSOL: THE RELATIVE CONTRIBUTION OF MARINE AND CONTINENTAL COMPONENTS. *J. Geophys. Res., 78(27):6429-6265, Sept. 20, 1973. 32 refs.*

Vertical profiles from the surface level to 9 km of the atmospheric aerosol concentration of sodium, chloride, potassium, manganese, bromide, and silicon were obtained at desert, ocean, and midcontinental (Nebraska) locations. Aerosol samples were collected by filtration at each location throughout an entire year and were analyzed by neutron activation techniques, with element-element correlations, year-round mean elemental ratios, and element logarithmic mean concentrations being determined for each altitude. The resulting profiles indicated an approach in the middle and upper troposphere to a uniform aerosol composed of 90-95 parts continental material and 5-10 parts marine material. The continental profiles showed a continuous regime extending from ground level up to 9 km, whereas in the oceanic profiles two regimes were delineated. The lower or marine regime extended upward only 1 or 2 km; above the marine regime the aerosol elemental ratios and concentrations approached values for high tropospheric continental samples. (Author abstract modified)

43885 **APTIC NO. 66889**

Ehhalt, D. H.

TURNOVER TIMES OF 137CS AND HTO IN THE TROPOSPHERE AND REMOVAL RATES OF NATURAL AEROSOL PARTICLES AND WATER VAPOR. *J. Geophys. Res., 78(30):7076-7086, Oct. 20, 1973. 28 refs.*

The average vertical fluxes of cesium-137 and tritiated water between 40 and 50 degrees north are calculated from the mixing ratio profiles in the upper troposphere and from surface deposition data. Vertical fluxes during the spring of 1966 are 0.67 Cs-137 atoms/sq cm sec and 51 HTO molecules/sq cm sec. Turnover times are estimated as a function of altitude from these fluxes and from the vertical profiles of the mixing ratio. These times increase from a few days in the surface layer to 20 days for HTO and 30 days for Cs-137 at the tropopause. The turnover times and their latitude dependence hold approximately for all seasons between 30 and 50 degrees N. The tracer turnover times can be interpreted as removal times of natural aerosol particles and water vapor and in particular can be used to estimate the removal times of water vapor and aerosols injected by commercial aircraft in the upper troposphere. (Author abstract modified)

43886 **APTIC NO. 66765**

Frisken, William R.

THE ATMOSPHERIC ENVIRONMENT. *Washington, D. C., Resources for the Future, Inc., 1973, 75p. 80 refs.*

A review is presented on the atmospheric environment of cities and on the effects of industrial activities on climate change. Topics covered include: the heat island circulation system, coupling with regional winds, turbulent diffusion and air pollution, the effects of mesoscale circulation, pollutant sinks, the modeling of physical processes and pollutant diffusion in the atmospheric boundary layer, fundamentals of climate, simple and general circulation models of the atmosphere, the effect of aerosols, water vapor, carbon dioxide and heat on climate, and the possible use of numerical modells for predicting climatic change.

43887 **APTIC NO. 66815**

Galloway, T. R. and S. T. Massie

ATMOSPHERIC PARTICULATE DATA FROM LONG PATH EXTINCTION. *Preprint, California Univ., Berkeley, Sanitary Engineering Research Lab., 13p., 1973 (?). 29 refs.*

Long path spectral extinction coefficients were obtained over the San Francisco Bay Area by tracking photometric standard stars from the zenith down to the near horizon. A model of an urban atmosphere was formulated which includes stratospheric, tropospheric, and regional contributions from Rayleigh scattering, ozone, nitrogen oxides, particulates, and aerosols. The model predicts favorably the observed extinction from a wide range of observatory sites. The extinction on a global scale varied systematically from those at Chabot Observatory in Oakland to those at Mauna Kea, Hawaii according to the distance from the nearest urban center with a population over 10 to the 5th power. From the Chabot extinction data, mean aerosol densities were derived and correlations were made with the Air Pollution Control District s measures of urban pollution. These data were used to predict atmospheric aerosol particle size distributions that were in good agreement with those measured by pointwise laboratory techniques. (Author abstract modified)

43888 **APTIC NO. 66911**

Gibbs, A. G. and W. G. N. Slinn

FLUCTUATIONS IN TRACE GAS CONCENTRATIONS IN THE TROPOSPHERE. *J. Geophys. Res., 78(3):574-576, Jan. 20, 1973. 2 refs.*

A mathematical model is devised to determine the relationship between the fluctuations in trace gas concentrations in the troposphere and the gas removal rates. A differential equation is set up in which correlations between the concentration fluctuations and fluctuations in source and sink strengths experienced in each air mass are emphasized; diffusion does not appear explicitly in the equation for the sake of simplification of the mathematical operation. The model suggests that the coefficient of dispersion of the fluctuations of the gas concentration arising from variations in the production rate is proportional to the square root of the gas removal rate. (Author abstract modified)

43889 **APTIC NO. 66939**

Goldman, A., D. G. Murcray, F. H. Murcray, W. J. Williams, J. N. Brooks, and C. M. Bradford

VERTICAL DISTRIBUTION OF CO IN THE ATMOSPHERE. *J. Geophys. Res., 78(24):5273-5283, Aug. 20, 1973. 42 refs.*

The carbon monoxide vertical distribution profile in the atmosphere was derived from observations of the solar spectrum with a balloon-borne infrared grating spectrometer at altitudes ranging from ground through 30 km. Intense CO lines from both P and R branches were observed in the 2150/cm region. The R(2) and R(3) lines in the (1-0) fundamental band were clearly isolated from the neighboring water and nitrous oxide lines so that the vertical distribution of CO could be determined from these lines. A line-by-line, layer-by-layer computer program was developed that derives CO amounts in a layered atmosphere where the layers are defined by the actual altitudes of observations. The resulting altitude profile showed that the CO concentration between 4 and 15 km is gradually decreasing from approximately 0.08 ppm to 0.04 ppm. (Author abstract modified)

43890 **APTIC NO. 66788**

Johnston, H. S.

CATALYTIC REDUCTION OF STRATOSPHERIC OZONE BY NITROGEN OXIDES. *Advan. Environ. Sci. Technol., vol. 4:264-380, 1973 (?). 92 refs.*

The catalytic reduction of stratospheric ozone by nitrogen oxides is examined. Topics covered include: the structure and composition of the stratosphere, including artificial increases in stratospheric nitrogen oxides from supersonic transport aircraft; oxygen-ozone photochemistry; nitric oxide catalyzed ozone destruction; other ozone-destroying reactions, including free radical reactions; the formation of nitric and nitrous acids; smog reactions; steady-state ozone profiles; instantaneous global reaction rates; a comparison of natural and artificial source strengths of nitrogen oxides in the stratosphere; and comparisons with other studies of atmospheric ozone reactions. The amount and distribution of ozone in the stratosphere is such that it cannot be explained by pure air photochemistry, suggesting that some other constituent in the stratosphere plays a major role in the natural ozone balance. Catalytic destruction of ozone by nitrogen oxides appears to be the only reaction fast enough to account for the observed stratospheric changes. Concentrations of nitric oxide and nitrogen dioxide from SST operation is estimated to be capable of reducing the ozone shield by a factor of two.

43891 **APTIC NO. 66812**

Kothny, Evaldo L.

THE THREE-PHASE EQUILIBRIUM OF MERCURY IN NATURE. *Advan. Chem. Ser., no. 123:48-80, 1973. 125 refs. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry Meeting 162nd, Washington, D. C., Sept. 15, 1971.)*

A model is developed for the dynamics of mercury exchange in nature assuming an equilibrium between Hg in contiguous phases. Mercury levels are postulated to be the result of equilibrium between the contents in the atmosphere, particulate matter, and rocks. The metal is released into air by outgassing of soil, transpiration and decay of vegetation, and by heating processes. Most Hg is adsorbed onto atmospheric particulate matter which is removed from the air by dry fallout and rainout. Humic material forms complexes which are adsorbed onto alluvium, and only a small soluble fraction is taken up by biota. Small clay particles and rainout particles are distributed throughout the oceans because of the slow settling speed. Pelagic organisms agglomerate the Hg-bearing clay particles, thus promoting sedimentation and acting as one source for Hg in the midoceanic chain. Another source is the uptake of dissolved Hg by phytoplankton and algae. In urban-industrial areas the Hg content of particulate matter obtained by filtration appears to be maximized when sampling under humid and reducing atmospheric conditions as opposed to dry and oxidizing conditions. (Author abstract modified)

43892 **APTIC NO. 66816**

Ludwig, F. L. and Walter F. Dabberdt

EFFECTS OF URBANIZATION ON TURBULENT DIFFUSION AND MIXING DEPTH. *Preprint, Stanford Research Inst., Menlo Park, Calif., 17p., 1973 (?). 14 refs.*

The effects of urbanization on turbulent diffusion and mixing depth of air pollutants are discussed. Wind direction fluctuation data indicate that turbulent diffusion in urban areas is significantly larger than in the country. Urban diffusion occurs at a rate characteristic of less stable rural conditions. Differences between urban and rural dispersion are approximately equivalent to changes of one Pasquill stability class. Nighttime urban mixing depths are greater than the corresponding rural values because of the heat island effect. Empirical relationships and Summers simple model of the heat island are used to derive an expression for the urban mixing depth in terms of city population and rural lapse rate. The expression was in reasonably good agreement with lidar observations of mixing depth in St. Louis. (Author abstract modified)

43893 **APTIC NO. 66944**

McConnell, John C.

ATMOSPHERIC AMMONIA. *J. Geophys. Res., 78(33):7812-7821, Nov. 20, 1973. 54 refs.*

The photochemistry of atmospheric ammonia is examined. Reaction with hydroxy radicals and heterogeneous loss are the dominant removal mechanisms in the troposphere with photolysis being the most important mechanism in the stratosphere. Oxidation of NH3 to nitric oxide in the troposphere means a source magnitude of 10 to the 14 g/yr, with such a production rate appearing adequate to balance the loss of nitrogen oxides from the atmosphere. The presence of a comparable source of NO from the soil is not required under these conditions but cannot be ruled out either. Alternatively, if destruction of NH3 leas to loss of NO, the removal rate of NOx in the atmosphere must be balanced by a source of magnitude of 10 to the 14 g/yr which probably results from biological soil reactions. The natural NO sources are in either case four times greater than anthropogenic sources. The potential stratospheric NO source from NH3 is of the same magnitude as that from nitrous oxide and that from a fleet of 500 supersonic aircraft; thus, the NH3-NO source should be included when the potential environmental effects of a fleet of SST are considered. If NH3 loss should result in a sink for stratospheric NO, there must be an as yet identified NO source of comparable magnitude in the stratosphere.

43894 **APTIC NO. 67010**

Moon, Albert E. and F. L. Ludwig

PREDICTING MOTOR VEHICLE AIR POLLUTION CONCENTRATIONS FROM HIGHWAY NETWORK ANALYSIS. *Highway Res. Rec., no. 465:96-104, 1973. 8 refs.*

NTIS: PB 227144

An urban diffusion model was developed that uses urban transportation planning variables, such as speeds, volumes, and distances on network links, together with readily available meteorological data to forecast concentrations of carbon monoxide in an urban area. The model includes a submodel that computes CO concentrations in urban street canyons, taking account of CO produced within the canyon as well as background CO. The model is particularly well suited to evaluation of the relative air pollution potential of alternative urban highway networks. It can also be used to evaluate alternative strategies for meeting air quality standards and to indicate sites for air quality monitoring stations. The model was validated in a 2-year program that has included comparison of historical data from continuous air monitoring stations and instrumented sites in St. Louis and San Jose. The model will be expanded to take account of other pollutants such as oxides of nitrogen. (Author abstract)

43895 **APTIC NO. 66887**

Moore, H. E., S. E. Poet, and E. A. Martell

RADON-222, 210PB, 210BI, AND 210PO PROFILES AND AEROSOL RESIDENCE TIMES VERSUS ALTITUDE. *J. Geophys. Res., 78(30):7065-7075, Oct. 20, 1973. 27 refs.*

Results of measurements of radon-222, lead-210, bismuth-210, polonium-210, and strontium-90 concentrations in the air at various altitudes up to 16 km over the continental United States are presented and discussed in relation to their sources and application as tracers for thy estimation of the residence time of particles in the troposphere and lower stratosphere. The ratios of these isotopes indicate that the simple steady state model does not apply to the long-lived radon daughters. Comparison of mean radioisotope concentration profiles with a theoretical model indicates that the mean aerosol residence time in the troposphere is less than 7 days and that most of the Po-210 in the troposphere is of continental surface origin. The magnitude of the increase in mean aerosol residence time with altitude within the troposphere appears to be less than a factor of 3. The mean aerosol residence time in the lower stratosphere is calculated to be about 1-2 months, approximately 10 times that of tropospheric aerosols. (Author abstract)

43896 **APTIC NO. 67009**

Myrup, L. O.

IMPACT OF HIGHWAYS ON AIR QUALITY. *Highway Res. Rec., no. 465:75-95, 1973. 36 refs.*

NTIS: PB 227144

A general survey is presented of the techniques by which the impact of highways on air quality may be measured and predicted. The processes by which air pollution emitted by moving vehicles is dispersed by atmospheric turbulence and transported by the wind are central to this problem. Application of micrometeorological theory and experience shows that the Richardson number is the most important parameter governing turbulent dispersion. The major existing theories available for the development of air quality models are discussed. An analysis is presented of a typical highway air quality impact study that included a measurement program and development of a model to predict air quality in 1990. The measurement program was inadequate to verify the model, and little confidence could be placed in the future air quality projection. Four general conclusions are as follows: The microclimate is an important key to the problem of highway air quality because it determines the ability of the atmosphere to disperse air pollution and is closely related to land use patterns; the Richardson number should be a standard part of any air quality measurement program; better and more comprehensive measurement programs should have a higher priority than the development of more complex air quality models; and more attention should be paid to the inherent properties of the model. (Author abstract)

43897 **APTIC NO. 666[illegible]3**

Padmanabhamurty, B. and R. E. Munn

A CASE STUDY OF MIXING-HEIGHT VARIATIONS IN THE TORONTO AREA. *Atmosphere, 11(1):21-25, 1973. 3 refs.*

The variation of mixing height in the Toronto area was investigated using data from three rawinsonde stations which made special observations at 2-hour intervals during 9 days in Dec. 1970. The afternoon maximum mixing heights were estimated in two ways: from the sequence of rawinsonde flights and from the 1200 GMT sounding and the afternoon maximum surface temperature (the standard method applied to the synoptic twice-a-day network of rawinsonde stations across North America). A comparison of the two estimates revealed considerable scatter, presumably due to mesometeorological variations and advection effects. The case of doming of the early morning mixed layer over downtown Toronto was studied. The time sequence of mixing heights and the effect of urban heat island on mixing heights are discussed. The height of the surface mixed layer is of considerable importance in the prediction of pollution potential and of pollution concentrations. (Author abstract modified)

43898 **APTIC NO. 66946**

Robinson, E., R. A. Rasmussen, H. H. Westberg, and M. W. Holdren

NONURBAN NONMETHANE LOW MOLECULAR WEIGHT HYDROCARBON CONCENTRATIONS RELATED TO AIR MASS IDENTIFICATION. *J. Geophys. Res., 78(24):5345-5351, Aug. 20, 1973. 8 refs.*

Non-methane low molecular weight hydrocarbon concentrations in natural or nonpolluted areas were related to air mass identification using available gas chromatographic data on atmospheric hydrocarbons classified according to meteorological air mass. Tropical maritime air moving onshore from the Pacific in the summer has the lowest general concentration of hydrocarbons in the two to six carbon range. Maritime polar air masses in winter and arctic air masses show higher concentrations. Amazonian equatorial air masses in both wet and dry seasons have much higher concentrations, two or more orders of magnitude, as compared to mid-latitude samples. Compounds that were typically identified in all samples include pentane, propane, butane, and acetone. The source of the atmospheric acetone concentrations may be atmospheric reactions involving vegetation-generated terpenes. Sources of the other compounds and atmospheric scavenging rates for these compounds are not well defined but undoubtedly are dependent on both atmospheric and biospheric processes. (Author abstract modified)

43899 **APTIC NO. 67340**

Saunders, P. J. W. and C. M. Wood

SULPHUR DIOXIDE IN THE ENVIRONMENT: ITS PRODUCTION, DISPERSAL AND FATE. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 2, p. 6-37. 72 refs.*

The production, dispersal, and fate of sulfur dioxide in the environment is reviewed. The average global concentration of SO2 is 0.25 micrograms/cu m. The only natural sources of primary SO2 are volcanic eruptions and forest fires. Most primary SO2 comes from the combustion of fossil fuels containing sulfur and industrial processes. Sulfur dioxide emissions from fuel burning in the United Kingdom are estimated at 5.69 million tons, while total emissions in the United States are estimated at only 30.1 million tons. The parameters which determine the process of dispersion and the long distance dispersal of SO2 and its effects upon climate are discussed. Concentrations in the urban and rural areas of the United Kingdom are tabulated. In the atmosphere, concentrations of SO2 are partly converted to sulfur trioxide and sulfuric acid and its salts by photochemical and catalytic oxidation processes. The degrees of oxidation is dependent upon the residence time of the gas, the intensity and duration of sunlight, and the atmospheric concentrations of moisture, catalysts, and alkaline materials.

43900 **APTIC NO. 66917**

Vukovich, Fred M.

SOME OBSERVATIONS ON THE VARIATIONS OF OZONE CONCENTRATIONS AT NIGHT IN THE NORTH CAROLINA PIEDMONT BOUNDARY LAYER. *J. Geophys. Res., 78(21):4458-4462, July 20, 1973. 7 refs.*

Chemiluminescence measurements at 1.5, 10, 20, and 40 m above ground level in the North Carolina Piedmont rural boundary layer indicate that the nocturnal behavior of ozone concentration is primarily governed by gas phase destruction of the ozone, with the destructive agents apparently having their source at the surface of the earth. Vertical diffusion of ozone may also play a significant role in its nocturnal behavior provided that the boundary layer stability is weak. Development of a strong inversion results in negligible vertical transport of ozone, with very little ozone reaching the earth s surface. Gas phase destruction, in this case, becomes a more important mechanism for ozone removal than destruction at the earth s surface. (Author conclusions modified)

1972

43901 **APTIC NO. 66713**

Conrads, L. A.

THE CITY: OBJECT OF METEOROLOGICAL STUDIES. *(De stad: Object van meteorologisch onderzoek). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 35-46. 9 refs.*

The meteorological and air pollution-related characteristics of cities are described, and actual measurements performed in Utrecht are reported. The high density of buildings, the great number of heat sources, including industrial stacks, and the reduced rate of evaporation result in the formation of heat islands over cities and dustdomes. Stable stratification may prevent the vertical dispersion of emissions. Compared to surrounding rural areas, urban areas are characterized by very high Aitken particle counts. Measurements performed in Utrecht revealed Aitken particle counts of over 100,000 per cu m, carbon monoxide concentrations of 4-18 ppm, and oxidant concentrations of up to 190 micrograms/cu m.

43902 **APTIC NO. 66631**

Fujii, Toru

PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu). Text in Japanese. Taifoon (Typhoon), no. 70:12-14, July 1972.*

Since the incident of photochemical smog on Aug. 27, 1971, in Osaka, the number of episodes has steadily increased. The formation mechanism of Los Angeles-type photochemical smog is described in comparison to the smog formation in London. In the Los Angeles-type, the primary pollutants such as nitrogen oxides and hydrocarbons are reacted by the effect of ultraviolet rays producing oxidants such as ozone, nitrogen dioxide, alkyl nitrate, peroxyacyl nitrate, and aldehydes. The relationship between the photochemical smog and oxidant concentration and the variation in pollutant concentrations on the day of photochemical smog in Los Angeles is shown in diagrams. The variation in pollutant concentrations on Aug. 27, 1971 in Osaka showing the increase in O3 concentration and the hourly changes in meteorological factors are shown in diagrams, which indicates the formation of photochemical smog. The effect of photochemical smog on human health and various symptoms of affliction are described. Also, the effects on plants, organic polymers, fibers and dyes are discussed.

43903 **APTIC NO. 66853**

Nikandrov, V. Y.

ROLE OF AEROSOLS IN THE FORMATION OF CLOUDS AND PRECIPITATION. *Tr. Vses. Meteorol. S ezda, 4th, Leningrad, USSR, 1972, p. 115-129. 11 refs. Translated from Russian by Dean F. W. Koolbeck, Air Force Systems Command Foreign Technology Div., Wright Patterson AFB, Ohio, Translation Div., FTD-MT-24-222-74, 25p., Feb. 25, 1974.*

NTIS, DDC: AD 776114

The influence of products of air contamination on the conversion of moisture in the atmosphere is described. The composition of the solid and liquid particles of impurities suspended in the air and that of gases which enter the atmosphere as the result of combustion of fuel, production processes, and transportation is extremely varied. Dust particles suspended in the air may serve as condensation nuclei. This was demonstrated with a Schultz counter. The number of particles of coal dust per cu cm of air recorded by the counter before expansion was on the order of 10 to the 4th power. After expansion the number was 10 to the 5th power particles. Soluble condensation nuclei are included in this large quantity of additional centers of consolidation of water vapor in the atmosphere. For example, during burning of anthracite which contains 0.3 to 20% sulfur, gaseous sulfur dioxide is formed. This gas is oxidized into sulfur trioxide and then into sulfuric acid, both soluble and very hygroscopic.

43904 **APTIC NO. 67028**

Sachdev, Sham L., J. P. Lodge, Jr., and Philip W. West

SPECIFIC METHOD FOR THE DETERMINATION OF OZONE IN THE ATMOSPHERE (FINAL REPORT). *Louisiana State Univ., Baton Rouge, Coates Chemical Labs., Environmental Protection Agency Contract CPA 22-69-100. Rept. EPA-R3-72-015, 14p., Jan. 1972. 4 refs.*

NTIS: PB-213 019

A simple, sensitive, and specific method for the determination of ozone in the atmosphere is described. Reactions of O3 with several l-alkenes were studied at room temperature. Eugenol (4-allyl-2-methoxy phenol), when reacted with O3, produced relatively large amounts of formaldehyde as compared to other l-alkenes tested. The method was compared with the alkaline iodide method for the determination of various concentrations of O3 in the range of 0.05 to 2.0 ppm. The reactions of O3 with eugenol yielded stoichiometric amounts of formaldehyde. Hydrogen peroxide, peracetic acid, sulfur dioxide, and various reducing agents commonly present in the air, do not interfere with the method. Formaldehyde in the air must be determined simultaneously and the concentration of formaldehyde subtracted from that of the O3. Any formaldehyde monitoring equipment can be easily adopted for the determination of O3. (Author abstract modified)

43905 **APTIC NO. 66712**

Schmidt, F. H.

METEOROLOGICAL ASPECTS OF AIR POLLUTION. *(Meteorologische aspecten van luchtverontreiniging). Text in Dutch. In: Milieubalans van Nederland. J. J. Muickhuyse (ed.), Amsterdam/ Brussels, Intermediair, 1972, p. 25-34. 6 refs.*

The effect of the meteorological conditions on the transport and dispersion of pollutants emitted from punctiform sources, and the effect of air pollutants on the soil and atmosphere are described. While pollutant transfer is largely determined by wind speed and direction, the atmospheric dispersion of pollutants emitted from high punctiform sources is essentially influenced by the meteorological conditions, such as turbulence and atmospheric stability conditions. Stable temperature stratification, and especially temperature inversion may impede the dispersion of such emissions. As demonstrated in Sweden, sulfur dioxide washout out of the atmosphere may increase the soil pH value. Increase in the Aitken particle count in inhabited areas due to traffic and combustion processes was observed. Such a development in the stratosphere due to aircraft can not be ruled out.

1971

43906 **APTIC NO. 67361**

Berry, R. Stephen and Peter A. Lehman

AEROCHEMISTRY OF AIR POLLUTION. *Annu. Rev. Phys. Chem., vol. 22:47-84, 1971. 73 refs.*

The aerochemistry of pollutants from two principal categories of general sources, space heating and power generation, and transportation, is reviewed. The principal pollutants from the combustion of coal, oil, and gas for space heating and power generation are carbon dioxide, sulfur dioxide, nitric oxide, and particulates (consisting mostly of inorganic ash, unburned coal, carbon, and high molecular weight hydrocarbons). Pollutants arising from stationary and moving sources which are discussed are nitrogeen oxides and polynuclear hydrocarbons. Pollutants from transportation include carbon monoxide and constituents of photochemical smog. The various hydrocarbons which interact with NOx and sunlight to produce photochemical smog originate almost exclusively from the internal combustion engine. Photochemical smog mechanisms, pollution transport, and chemical reactions are described. Pollution models are presented for photochemical smog production in which aerochemistry plays an essential role.

43907 **APTIC NO. 67326**

East, Conrad

URBAN HEAT IN MONTREAL. *(Chaleur urbaine a Montreal). Text in French. Atmosphere, 9(4):112-122, 1971. 3 refs.*

The thermal island and factors influencing it were studied over Montreal by means of board instruments of a helicopter at altitudes of up to 900 m from Feb. 1968 to July 1969, and a related model study was performed for industrial, domestic, and traffic heat generation. A linear relationship was established between the heat generation and the number of degrees below 65 F, as well as the wind velocity. The total heat generated was about five times the artificially generated heat due to combustion, the difference is due to solar radiation.

1970

43908 **APTIC NO. 67300**

Allen, Eric R.

PHOTOCHEMICAL POLLUTANTS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 255-263, 1972. (Aug. 3-15.)*

Problems associated with photochemical pollutants are discussed. The majority of photochemical pollutants originate from the interaction of solar radiation with high levels of automobile exhaust emissions in a stagnant meteorological system. There are no accurate or reliable analytical techniques to measure automobile exhaust, ozone, and peroxyacyl nitrates which exert considerable effect in the polluted atmosphere. Information on the number and size distribution of aerosols, as well as their type, is essential to the understanding of atmospheric optical and chemical properties. Very little is known about the reactions of absorbed gases on particles or in aerosol droplets. The distribution of aerosols including their lifetimes, size, number and optical properties as well as the removal processes of coagulation and settling or dispersion by air movements should be incorporated into computer models. The effects of air pollutants on humans, animals, plants, and materials are not understood.

43909 **APTIC NO. 67029**

Charlson, R. J.

PRELIMINARY DATA ON BACKGROUND AEROSOLS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 273-282. 15 refs. (Aug. 5-15.)*

Preliminary measurements were made of the scattering component of the extinction coefficient of air (b subscript scat) taken with the angular integrating nephelometer in remote locations which indicate the existence of a background level. If there were an identifiable property of background atmospheric aerosol, long term monitoring of this property of the atmosphere could be used as an indicator of changes in world wide aerosol pollution. Short term variations might provide evidence regarding the mixing time of the atmosphere relative to the residence time of the particulate matter in air. The mean aerosol mass concentrations at Pt. Barrow, Alaska and Mt. Olympus, Wash. were approximately 8 and 4 micrograms/cu m respectively. The upper and lower limit using 90% confidence limits for the correlation of mass concentration with b subscript scat would be from 1.6 to 16 micrograms/cu m. This agrees with typical minimum values observed by the National Air Sampling Network of approximately 10 micrograms/cu m.

43910 **APTIC NO. 67301**

Charlson, R. J.

INSTRUMENTATION FOR MEASURING OPTICAL PROPERTIES OF AEROSOLS PERTINENT TO THE HEAT BALANCE PROBLEM. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 283-289, 1972. 5 refs. (Aug. 3-15.)*

Instrumentation for measuring optical properties of aerosols pertinent to the heat balance problems is discussed. The extinction coefficient due to scattering and its backscattering component are measured with the intergrating nephelometer using the same field techniques as for carbon dioxide. The integral of extinction over the whole atmosphere is routinely measured with the pyrheliometer or the less expensive Volz photometer. Scattering and absorption of incoming radiation by background aerosol can be expected to effect the albedo which is measurable from satellites. Long term monitoring of albedo might provide information on the increase of light absorption by soot and other substances of human origin. There is no accurate, direct measurement for the absorption coefficient of atmospheric aerosol. The use of laser radar to monitor tropospheric aerosols holds promise largely because of its remote sensing capability, and potential for producing large amounts of data.

43911 **APTIC NO. 67030**

Derr, V. E.

RESEARCH PROBLEMS IN THE USE OF LIDAR IN ANTI-POLLUTION STUDIES. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 309-321. 3 refs. (Aug. 5-15.)*

The use of lidar in the measurement of aerosols, smoke stack constituents, humidity profiles, and wind velocities is discussed. The limitations of present systems that are potentially removable through research are indicated. Lidar has direct application to the specific task of remote detection and measurement of gaseous pollutants when Raman scattering and fluorescence are used. These radiative interactions produce an output at a frequency that differs from the irradiating frequency. The frequency of the scattered radiation is usually uniquely related to the scattering molecule, allowing identification. Lidar can be used in the remote measurement of water profiles by Raman scattering, and also in the remote measurement of wind profiles by Mie scattering. Wind and water vapor profiles are important in the prediction of weather conditions leading to pollution trapping or dissemination conditions. The major problems remaining in aerosol and wind sensing are the determination of size and shape distributions and the determination of composition by remote means. Better statistics of atmospheric aerosol composition are required to set limitations on possible distributions in nature. The use of Raman and fluorescent lidar can be expanded once the basic components and basic spectroscopic properties of the atmosphere are known.

43912 **APTIC NO. 67303**

Hanson, Kirby J.

MEASUREMENTS OF AEROSOLS IN THE ATMOSPHERE. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 371-415, 1972. 36 refs. (Aug. 3-15.)*

The composition of aerosols in the atmosphere is discussed and literature on their measurement is summarized. There is a simultaneous increase in dust and ozone near the local tropopause and another increase in dust concentration that can be associated with the level of the tropical tropopause. The region between the local tropopause and the level of the tropical tropopause is typified by thin dust layers showing a high positive correlation with O3. Measurement techniques include: direct measurement, data inferred from sunlight measurement; searchlight and laser probing; twilight photometry; remotely sensed attenuation measurements; and direct infrared measurements.

43913 **APTIC NO. 67306**

Martell, E. A. and S. E. Poet

RESIDENCE TIMES OF NATURAL AND POLLUTANT AEROSOLS IN THE TROPOSPHERE. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 459-476, 1972. 20 refs. (Aug. 3-15.)*

The atmospheric residence time of particles, the average time the particles remain in a given region or layer of the atmosphere, was estimated experimentally using natural and artificial radioactivity in the atmosphere as tracers. Because atmospheric polonium-210 is derived from a combination of natural and pollutant sources, its usefulness as an atmospheric tracer is greatly reduced and published estimates of aerosol residence times based on Po-210/lead-210 activity ratios are unreliable and much too high. Tropospheric aerosols have a much shorter atmospheric residence time than is generally appreciated. If so, natural and pollutant aerosols will not be well mixed zonally but for the most part will be deposited within a few hundreds of miles downwind of their sources.

43914 **APTIC NO. 67307**

McClintock, Michael

APPLICATIONS OF LASERS TO AIR POLLUTION RESEARCH. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 477-503, 1972. 39 refs. (Aug. 3-15.)*

The applications of lasers to air pollution research are reviewed. The techniques of resonance fluorescence, Raman scattering, infrared absorption, Rayleigh scattering, and Mie scattering are described. The mechanism by which the techniques can detect and identify molecular pollutants is discussed. The spectra of pollutants do not tend to overlap. The Raman spectra are known for nitrogen, oxygen, water, carbon dioxide, carbon monoxide, and the carbon-hydrogen bond. Scattering from aerosols occurs at various heights and it is necessary to distinguish between the scatters.

43915 **APTIC NO. 67309**

Robinson, G. D.

PARTICLES IN THE ATMOSPHERE AND THE GLOBAL HEAT BUDGET. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 557-569, 1972. 15 refs. (Aug. 3-15.)*

The effects of atmospheric aerosols on the global heat budget is discussed. A purely scattering particle in the atmosphere cannot decrease the global albedo, but an absorbing particle can in some circumstances decrease albedo if it is above a very highly reflecting surface. The effect of some examples of heavy urban aerosol loading were computed and show that in temperate latitudes the changes in the solar and terrestrial radiation field are comparable in magnitude, and the net effect on the heat budget is very difficult to estimate without detailed computation. Scattering in the terrestrial infrared cannot be neglected in spite of the very low scattering coefficients.

43916 **APTIC NO. 67032**

Scorer, R. S.

THE INTERACTION OF LOCAL WEATHER AND AIR POLLUTION PROBLEMS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 571-585. 2 refs. (Aug. 5-15.)*

The interaction of local weather and air pollution problems is discussed. Chimney height is the essence of architectural and many urban and valley problems. Dense layers, particularly of hygroscopic particles can, through their radiative effects and by promoting the formation of natural wet clouds, alter the climate of valleys. In cold regions the addition of water vapor by a source may itself be calamitous even though it is not in the least noxious. Because of the essentially complex and individual nature of local climate and weather and its possible modification by pollution, the prediction of what will happen to pollution cannot be done theoretically in advance or in general terms. Forecasts can only be the outcome of an intense geographical study.

43917 **APTIC NO. 67033**

Urone, Paul

THE CHEMISTRY OF SULFUR COMPOUNDS IN THE ATMOSPHERE. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 587-597. 7 refs. (Aug. 5-15.)*

The chemistry of sulfur compounds in the atmosphere is reviewed. The annual amount of S introduced into the atmosphere is 220 times 10 to the 6th power tons, 76 times 10 to the 6th power tons of this as hydrogen sulfide and sulfur dioxide from pollutants. In air, the concentration of SO2 has been used as an index of air pollution severity. It is an acid anhydride, dissolves readily in water and imparts an acidic, corrosive nature to mists formed in the vicinity of its emission sources. Sulfur dioxide is readily oxidized to sulfur trioxide which then rapidly combines with water vapor to form sulfuric acid mist. Whenever ammonia is present, a considerable amount of ammonium sulfate as solid particulates is found in the atmosphere. Most of the reactions of SO2 in air are generally explained by the use of some photochemical mechanism. The photochemical reaction rate of SO2 in clean air is slow and almost independent of the presence of water vapor. In the presence of nitrogen oxides and hydrocarbons, the photochemical reaction rate increases markedly. In polluted air and in the presence of fog or mist, the rate is very rapid. Sulfur dioxide reacts with hydrocarbons to form sulfur containing aerosols.

43918 **APTIC NO. 67310**

Urone, Paul

THE CHEMISTRY OF SULFUR COMPOUNDS IN THE ATMOSPHERE. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 587-598, 1972. 7 refs. (Aug. 3-15.)*

The chemistry of sulfur dioxide in the atmosphere is discussed. Sulfur dioxide in air comes almost entirely from pollution sources. The average tropospheric concentration is estimated at 0.2 ppb. In industrial areas it is frequently 1000 to 10,000 times this concentration. Its concentration has been used as an index of air pollution severity. Sulfur dioxide is readily oxidized to sulfur trioxide which then rapidly combines with water vapor to form sulfuric acid mist. The photochemical reaction rate of sulfur dioxide in clean air is quite slow, but increases markedly in the presence of nitrogen oxides and hydrocarbons. Sulfur dioxide reacts with hydrocarbons to form sulfur containing aerosols.

43919 **APTIC NO. 67311**

Washington, Warren M.

ON THE POSSIBLE USES OF GLOBAL ATMOSPHERIC MODELS FOR THE STUDY OF AIR POLLUTION. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 599-613, 1972. 7 refs. (Aug. 3-15.)*

The application of global atmospheric computer models for studying air pollution is discussed. The construction of the model is outlined and applied to thermal pollution caused by industries. Air pollution can interact with the heat balance of the atmosphere. Aerosols such as natural haze from vegetation, smoke, dust, and smog tends to increase the albedo, causing less absorption of solar radiation within the atmosphere and at the ground. In urban areas the air temperatures are usually warmer than the surrounding rural areas. This effect, called urban heat island, is a result of human activities. Experiments with the model show that if enough energy is put into the atmosphere by power plants and cities, the surface temperatures over the continents will warm up.

1967

43920 **APTIC NO. 67363**

Bowling, Sue Ann

A STUDY OF SYNOPTIC-SCALE METEOROLOGICAL FEATURES ASSOCIATED WITH THE OCCURRENCE OF ICE FOG IN FAIRBANKS, ALASKA. *Alaska Univ., College, Thesis (M.S.), May 1967, 151p. 40 refs.*

The two distinct types of ice fog of Fairbanks, Alaska were investigated. A type I event occurs when a migratory, and generally rapidly intensifying, Siberian High moves eastward into Alaska. This migration is preceded by the formation of a 700 mb ridge in or slightly west of the Bering Strait, and by a junction in the low level circulation of the Siberian High with that of a migratory Pacific High. In these events, Fairbanks temperatures aloft rise during the periods with clear skies when radiative cooling decreases the surface temperature. This behavior is attributed to advection of Pacific air combined with subsidence in the Siberian air. Type II events, rare but prolonged and extremely severe, occur when a Siberian High expands to cover northern Alaska after contact with a migratory Pacific High. The 700 mb pattern generally has a High centered near the East Siberian Sea and a low in Southern Alaska. (Author abstract modified)

BASIC SCIENCE AND TECHNOLOGY

1974

43921 **APTIC NO. 66929**

Charpentier, Jean-Claude and Andre Laurent

SOME CONSIDERATIONS AND RECALLS ON THE DESIGN OF GAS ABSORBERS: LABORATORY APPARATUS TO SIMULATE ABSORBER AND TO PREDICT THE EFFECT OF CHEMICAL REACTION. *Am. Inst. Chem. Engrs. J., 20(5):1029-1031, Sept. 1974. 12 refs.*

Theoretical considerations are presented on the simulation of industrial gas absorbers by laboratory equipment for the purpose of predicting the effect of the chemical reaction. The essential feature of a laboratory model gas absorber to be reproduced is the value of the mass transfer coefficient. There is a particular liquid flow rate for industrial packed columns at which value of the mass transfer coefficient and therefore the enhancement factor will be the same as for a stirred vessel laboratory model. The enhancement factor in the column varies as the superficial flow rate in the column is systematically varied, such that the ratio of the industrial absorber enhancement factor to the laboratory apparatus enhancement factor is unity when the superficial velocity of the liquid has such a value as to make the value of the mass transfer coefficient in the industrial column identical with that in the laboratory vessel. Experiments may be repeated with a number of different reacting solutions, with the values of the enhancement factor in the laboratory apparatus being measured at different stirring speeds. It is then possible to determine and tabulate the stirring speed corresponding to any flow rate in the industrial reactor and the corresponding rates of absorption in the inert solution. Ranges of contact times are tabulated for different industrial gas-liquid absorbers and laboratory models.

43922 **APTIC NO. 66975**

England, Christopher and William H. Corcoran

KINETICS AND MECHANISMS OF THE GAS-PHASE REACTION OF WATER VAPOR AND NITROGEN DIOXIDE. *Ind. Eng. Chem., Fundamentals, 13(4): 373-384, Nov. 1974. 37 refs.*

Studies of the gas-phase reaction of water vapor and the ppm concentrations of nitrogen dioxide were made at atmospheric pressure and near ambient temperatures. Of special interest in the work was careful chemical analysis -- water to values less than 2 ppm and nitric oxide and nitrogen dioxide to values less than 5 ppm -- and absence of mist. The initial rate of disappearance of NO2 was first order with respect to water and second order with respect to NO2. Nitric oxide and nitric acid were the principal products. A third-order rate constant of 5.5 (+ or - 0.29) times 10,000 sq l/sq mol/sec was found at 25 C. Results of the work are applicable to air pollution studies and to understanding the mechanism for absorption of NO2 into aqueous solutions. (Author abstract)

43923 **APTIC NO. 66655**

Gangoli, Narendra and George Thodos

KINETICS OF PHOSPHATE ADSORPTION ON ALUMINA AND FLY ASH. *J. Water Pollution Control Federation, 46(8):2035-2042, Aug. 1974. 4 refs.*

The kinetics of phosphate adsorption on alumina F1, alumina AHB, and fly ash were investigated. Fly ash is a waste product of thermal power generation stations. The adsorption kinetics data are tabulated. The concentrations of solution contacting the adsorbent at different termination times and the corresponding weights of adsorbent used are presented. The rate expression for fly ash was r equals 3.00 p minus 5.7 pi p to the 0.35 power; for alumina F1 it is r equals 0.012p minus 0.0908 over p subscript O to the 1.7 power times pi p to the 1.7; power for alumina AHB it is r equalt 0.025p minus 2.74 over p subscript o to the 0.70 power times pi p superscript 1.4.

43924 **APTIC NO. 66653**

Geddes, J., P. N. Clough, and P. L. Moore

CROSSED MOLECULAR BEAM STUDY OF REACTIVE SCATTERING: O AND CS2 YIELDS SO AND CS. *J. Chem. Phys., 61(5):2145-2149, Sept. 1974. 15 refs.*

The angular distribution and velocity of sulfur oxide (SO) reactively scattered from crossed molecular beams of oxygen atoms and carbon disulfide were measured. In c.m. coordinates, the SO is strongly forward scattered with an in-plane angular distribution represented by exp (minus theta/50 degrees), indicating a direct reaction mechanism. The mean recoil velocity of SO is independent of the c.m. angle. The average fraction of reaction exoergicity appearing as translational energy of product separation is less than 10%. The main channel for released energy is into rotation. The reaction proceeds via highly bent intermediate configurations. The total reaction cross section is estimated as 1.1 sq A. (Author abstract modified)

43925 **APTIC NO. 67173**

Golub, Stephen and Donald G. Fedak

THE INTERACTION OF SO2 WITH TUNGSTEN. *Surface Sci., 45(1):213-226, Sept. 1974. 13 refs.*

Room temperature chemisorption and high temperature thermal desorption measurements, performed under ultra high vacuum conditions, together with Auger electron spectroscopy, indicate that sulfur dioxide is similar to oxygen in its interaction with tungsten. Sulfur dioxide is strongly chemisorbed on polycrystalline tungsten, with an initial sticking probability of greater than 0.8 and a saturation surface concentration of 6 times 10 to the 14th power mol/sq cm, i.e., about 0.5 monolayer, or one oxygen atom for each tungsten atom. A model involving a room temperature surface reaction is proposed to account for the observed desorption of atomic sulfur at 1650 K, and the desorption of O2 in the form of volatile tungsten oxides WO, WO2, and WO3 in the temperature range of 1700-2000 K. At high temperatures (1000-2000 K), SO2 reacts continuously with tungsten, probably forming thick layers of tungsten oxides, with an activation energy of approximately 15 kcal/mole. In room temperature coadsorption experiments with carbon monoxide and SO2, the CO could not displace or adsorb on top of an adsorbed SO2 layer. (Author abstract)

43926 **APTIC NO. 66637**

Grillet, Yves, Michele Francois, and Dominique Debrun

THE ISOSTERIC HEAT OF ADSORPTION OF SULFUR DIOXIDE ON DIVERSE CARBONACEOUS AND NON-CARBONACEOUS ADSORBENTS. *(Sur la chaleur isosterique d adsorption du dioxyde de soufre sur divers adsorbants carbones ou non). Text in French. J. Chim. Phy., 71(5):666-672, 1974. 41 refs.*

The isosteric heat of adsorption of sulfur dioxide on diverse adsorbents (activated carbon, synthetic zeolites, metallurgic coke, silica gel, type W chromosorb, and alumina) was studied at 0 C, 20 C and 30 C, and over a pressure range from 0.00001 to 760 torr. The heat of adsorption as a function of surface coverage was measured, and calculated from a pair of (or several) isotherms at different temperatures by the Clausius-Clapeyron equation. The SO2 adsorption in the 0-30 C temperature range was found to be essentially of a physical nature, with less than 4% of the SO2 adsorbed at 0 C on dried and degassed adsorbents bound irreversibly. Similarity between the adsorption of nitrogen at -196 C and that of SO2 at 0 C was established. The SO2 adsorption in the 0-30 C temperature range takes place principally in pores with radii between 10 and 30 A. The quantity of the adsorbed SO2 was proportional to the adsorbate pressure at very low surface coverage. The isosteric heat is constant as a function of the surface coverage. The adsorption is most uniform on adsorbents with type I isotherm according to the BET classification.

43927 **APTIC NO. 66684**

Hayhurst, A. N. and Heather-Ann G. McLean

MECHANISM FOR PRODUCING NO FROM NITROGEN IN FLAMES. *Nature (London), 251(5473):303-305, Sept. 27, 1974. 16 refs.*

A preliminary attempt was made to test whether prompt nitric oxide is produced in flames in addition to that from the Zeldovich scheme. In the absence of added acetylene, NO rises sharply in the first 5 mm of the burnt gases and then almost constantly up to about 50 mm. There is another definite increase probably because of the entrainment of oxygen and nitrogen from the surrounding atmosphere, and afterburning of the excess hydrogen. The steady level attained by NO around 50 mm downstream is roughly 0.2 of that expected for equilibrium. The NO formation is by the Zeldovich scheme. In 1% by volume acetylene NO rises to a first steady level almost seven times higher, which is approximately that for equilibrium. Subsequently NO increases downstream because of air entrainment and the gradual temperature increase with afterburning. If afterburning is neglected, the data demonstrate that the prompt NO is almost six times that from the Zeldovich scheme. This is not always true, since the ratio of prompt to Zeldovich NO depends on such variables as H_2/O_2 in the unburnt gas supplies, flame temperature, and the quantity of acetylene added.

43928 **APTIC NO. 66682**

Homer, J. B., D. R. Jenkins, and M. M. Sutton

KINETICS OF NITRIC OXIDE FORMATION. *Riv. Combust., 28(5): 156-159, 1974. 4 refs. (Presented at the Flame Chemistry Panel of the International Flame Research Foundation, 3rd Meeting, Ijmuiden, Netherlands, May 11-12, 1971.)*

The kinetics of nitric oxide formation are discussed. The chemistry of the formation of NO in premixed hydrocarbon/air flames is controlled by nine comparatively slow radical recombination reactions. A chemical reaction scheme was compiled based on those reactions and 11 other minor reactions. There was good agreement between the prediction of the kinetic model and measured profiles of NO. The model is essentially correct even though the individual rates of some of the chemical reactions are not known to within maybe a factor of two, and the combined analysis is quantitatively acceptable. (Author conclusions modified)

43929 **APTIC NO. 66685**

Jager, J. and M. Rakovic

SULPHUR-DIOXIDE-INDUCED QUALITATIVE CHANGES IN POLYCYCLIC AROMATIC HYDROCARBONS ADSORBED ON SOLID CARRIERS. *J. Hyg., Epidemiol., Microbiol., Immunol. (Prague), 18(2):137-143, 1974. 7 refs.*

The products from the reaction of sulfur dioxide, pyrene, and 3,4-benzopyrene adsorbed on solid carriers were chromatographically analyzed. Sulfur was determined by neutron activation analysis. The principal products are sulfonic acids, 1-pyrenesulfonic acid, pyrenedisulfonic acid, and 3,4-benzopyrene-6-sulfonic acid. The absorption and fluorescence spectra of these compounds are presented. (Author summary modified)

43930 **APTIC NO. 66594**

Kanamaru, Kazuhiro and Shunichi Daito

ON THE FORMATION PROCESS OF NITROGEN OXIDE IN THE FLAME REACTION REGION (CONTINUED REPORT). *(Kaen hannoiki ni okeru NO shosei katei ni tsuite (Zokubo)). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Osaka, p. 155-158, 1974. (Presented at the Japan Society of Mechanical Engineers, National Meeting, 52nd, Osaka, Japan, Nov. 3-5, 1974, Paper 1515.)*

The system of nitrogen oxide formation by means of CH_2 and CH radicals and by the Zeldovich mechanism, was applied to methane flame. The nitric oxide and nitrogen dioxide formation were evaluated. Bowman's explanation of NO formation by means of the Zeldovich mechanism through correct evaluation of the oxygen atom overshoot did not sufficiently take into account the significance of transport processes in the flame. The NO was smaller than the temperature dependency anticipated from the Zeldovich mechanism.

43931 **APTIC NO. 66855**

Kim, Yong W.

AN ANALYTICAL CONSIDERATION OF THE PARTICLE INERTIA EFFECT WITH AN APPLICATION TO AEROSOL SAMPLING EFFICIENCY CALCULATION. *Lehigh Univ., Bethlehem, Pa., Dept. of Physics, Bureau of Mines Grant G0110235, TR 24, 89p., Jan. 1974. 12 refs.*

NTIS: N74-17023

The particle inertia effect, in the absence of all other competing effects, is treated analytically with parallel laboratory experiments for application to the calculation of aerosol sampling efficiency. Expressions for two universal coefficients are obtained which give rise to quantitative measures of the inertia effect for a variety of given flow fields. A two-dimensional sampler is used for studying the particle sampling efficiency in the presence of the pure inertia effect, and descriptions for the model system are established by first measuring the field with tracer particles and then comparing the measurement with existing theoretical results. A general scheme of computing the number of sampled particles for each specific size category is established and applied to the model system, with the results showing that the sampled particle number density exceeds the free stream density as a result of readjustment of the particle number density in the sampler inlet region due to the inertia effect. The sampling efficiency increases with particle size for the particles ranging from 1-10 micron in diameter. The prediction is confirmed by measurements of the particle size distribution before and after sampling, and a method is devised for particle size determination. (Author abstract modified)

43932 **APTIC NO. 66923**

Kochanov, M. M., A. O. Loyt, S. D. Zaugol nikov, and I. I. Stavchaniskiy

CALCULATION METHOD FOR THE DETERMINATION OF APPROXIMATE MAC VALUES OF POLLUTANTS IN THE AIR OF SETTLEMENTS. *(Raschetnyy metod opredeleniya orientirovochnykh PDK veshchestv v atmosfernon vozdukhe naselennykh punktov). Text in Russian. Gigiena i Sanit., no. 8:79-81, 1974. 1 ref.*

Correlations of the toxicological parameters, as well as mathematical formulas and nomograms for the determination of the approximate maximum allowable concentrations of different pollutants in the air are presented on the basis of regression analysis. Close correlations with factors ranging from +0.74 to +0.45 were established for such parameters as LD50 or LC50, and experimentally established instantaneous or daily average MAC values. The maximum allowable instantaneous and daily average MAC values as determined from various formulas, as well as experimentally established MAC values are presented for such pollutants as aniline, acetone, benzene, butylacetate, butyl alcohol, diethylamine, xylene, pyridine, toluene, carbon tetrachloride, chlorobenzene, furfural, ethanol, and ethylacetate.

43933 **APTIC NO. 67184**

Li, C. C.

A GENERALIZED CORRELATION OF GAS PERMEATION CONSTANTS. *Am. Inst. Chem. Engrs. J., 20(5):1015-1017, Sept. 1974. 9 refs.*

A generalized correlation for estimating gas permeation constants in a polymeric membrane is derived from the properties of the gas and the glass transition temperature of the polymer.

A fundamental premise of the correlation is the validity of a limited gas solubility in a membrane which can be described by Henry s law. The permeation constant is described by an Arrhenius equation which implies that the logarithm of the reduced permeation constant is a linear function of the reciprocal reduced temperature. Available literature data on gas permeation constants for a variety of polymers are used to verify the equation, and the equation appears to correlate well with the data. Although the accuracy of the correlation is not high, the equation is very useful for estimating gas permeation constants in a membrane using only the properties of the gas and the glass transition temperature of the membrane.

43934 APTIC NO. 66938

Low, M. J. D. and R. T. Yang

REACTIONS OF GASEOUS POLLUTANTS WITH SOLIDS. V. INFRARED STUDY OF THE SORPTION OF NO ON CAO. *J. Catalysis, 34(3):479-489, Sept. 1974. 48 refs.*

A Fourier transform spectrometer was used to examine the formation of a surface layer resulting from the sorption of nitric oxide on calcium oxide as well as the conversion and destruction of the layer by degassing and treatments with oxygen. Nitric oxide was taken up at pressure in the low microtorr range, with most of the surface layer being relatively firmly bound. Numerous infrared bands were observed, pointing to the existence of at least a dozen distinct surface species. Tentative band assignments suggested the formation of anions of NO, nitrogen dioxide, and nitrogen trioxide, the nitrosonium ion, and monodenate and bidentate nitrato complexes. At least six other species were unidentified, so that the mechanism could not be considered. The complexity of the results obtained were in contrast to previous studies on NO sorption. (Author abstract modified)

43935 APTIC NO. 66921

Lys, X.

FORMATION AND EVOLUTION OF NITROGEN OXIDES IN INTERNAL COMBUSTION ENGINES. *(Formation et evolution des oxydes d azote dans les moteurs a combustion interne). Text in French. Riv. Combust., 28(5):149-155, 1974. 10 refs.*

A mathematical model was developed to describe the evolution of the aerothermochemical values inside the combustion chamber of internal combustion engines, especially spark-ignition engines. Among the various mechanisms proposed, the bimolecular mechanism, involving molecular oxygen and nitrogen, initially described by Kaufman, was considered for nitric oxide formation. Although ignoring, but excluding, the combinations of atomic substances produced by dissociation, the bimolecular mechanism is justified since the atomic oxygen to molecular oxygen ratio is less than 10% at 3000 K temperature and under 13 atm pressure, and the atomic nitrogen concentration is on the order of magnitude of 1 ppm. The progression of the bimolecular reaction accelerates substantially with increasing temperature during the combustion process in the engine. The nitrogen oxide concentration decreases with increasing distance from the spark, and is highest at angles from 20 to 40 degrees relative to the top dead center.

43936 APTIC NO. 66995

Novakov, T., S. G. Chang, and A. B. Harker

SULFATES AS POLLUTION PARTICULATES: CATALYTIC FORMATION ON CARBON (SOOT) PARTICLES. *Science, 186(4160):259-261, Oct. 18, 1974. 13 refs.*

Experimental evidence (obtained by electron spectroscopy for chemical analysis) is presented which shows that finely divided carbon (soot) particles may play a major role in the catalytic oxidation of sulfur dioxide to sulfate in polluted atmospheres. The results obtained with sulfates produced in the laboratory by the oxidation of sulfur dioxidy on graphite particles and combustion-produced soot particles are compared with the properties and behavior of ambient sulfates. The proposed SO2 oxidation mechanism is qualitatively consistent with field observations. The catalytic formation of sulfate on soot is expected to occur in the open atmosphere and especially in or near combustion sources where both SO2 and soot concentrations are highest. Although the sulfate formation mechanism described may not be the only atmospheric sulfate-producing process, it probably plays a major role in urban atmospheres characterized by high concentrations of particulate carbon. (Author abstract modified)

43937 APTIC NO. 67193

Obuchi, Akira, Akitsugu Okuwaki, and Taijiro Okabe

THE RATE OF OXIDATION REACTION OF NITRITE IN AN ALKALINE PERMANGANATE SOLUTION. *(Ashosan ion no arukarisei kamangansan karimu ni yoru sanka hanno sokudo). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 8:1425-1429, Aug. 1974. 5 refs.*

The oxidation rate of nitrite by manganate and permanganate was studied in .0002 M potassium hydroxide solution at 20-80 C in order to investigate the possibility of removing nitrogen oxides with salts of manganese oxyacids. Permanganate oxidized nitrite to nitrate as expressed by the reaction involving nitrite plus 2 moles of permanganate plus 2 moles of hydroxy ion proceeding to nitrate plus 2 moles of reduced permanganate plus water. An expression was also developed for the rate of nitrite oxidation with respect to time. Nitrite was not oxidized with manganate in an alkaline solution.

43938 APTIC NO. 66907

Penzhorn, Ralf-Dieter, Hans Guesten, Ulrich Schurath, and Karl H. Becker

QUENCHING OF SINGLET MOLECULAR OXYGEN BY SOME ATMOSPHERIC POLLUTANTS. *Environ. Sci. Technol., 8(10):907-909, Oct. 1974. 15 refs.*

Room temperature rate constants for the deactivation of singlet molecular oxygen by sulfur dioxide, hydrogen sulfide, methyl mercaptan, dimethyl ether, formaldehyde, ambient air, and dry synthetic air were measured in a 220 cu m low pressure reactor under static conditions to investigate the chemical quenching activity of such air pollutants on the excited oxygen species. The compounds deactivated singlet oxygen at rates comparable to or lower than ground state molecular oxygen, with single oxygen not appearing to contribute to the atmospheric conversion of the trace gases investigated. However, because such reactions of contaminant species with atmospheric singlet oxygen would probably lead to products of a highly oxidizing nature, they may possibly be precursors of or be themselves substances hazardous to health, though the products of such reactions are not known and thus the toxicological role of singlet oxygen in air pollution unanswered.

43939 APTIC NO. 66908

Pillai, P. K. C., C. S. Su, and E. L. Shriver

INVESTIGATIONS OF ELECTRET AS A CONTAMINATION CONTROL DEVICE. *Environ. Letters, 7(3):261-266, 1974. 6 refs.*

A systematic study of the thermoelectret characteristics of polytetrafluorethylene (teflon) electret was made, and stable thermoelectrets with known surface charges and fields were used to collect xylene and acetone vapors under different experimental conditions in order to evaluate these electrets in terms of their pollution collecting capacity. Mass spectra results indicated that as the time of exposure increased from about a minute to 90 min there was a linear increase in the peak height, indicating that the amount of vapors collected over the electret was proportional to the duration of exposure. Vapors of these materials present in the atmosphere as contaminations can be effectively collected over the electret surface, with the presence of such contaminations on the electret being detectable by mass spectrometry. Thermoelectrets of polymers with stable surface charge on either side appear to function in their collecting capacity by attracting charged particles and ions to their surfaces.

43940 **APTIC NO. 66680**

Rosenberg, C. W. von, Jr. and Daniel W. Trainor

VIBRATIONAL EXCITATION OF OZONE FORMED BY RECOMBINATION. *J. Chem. Phys., 61(6):2442-2456, Sept. 1974. 45 refs.*

The vibrational excitation of ozone formed by recombination was investigated by coupling flash photolysis and time resolved infrared detection and ultraviolet absorption diagnostics. The reaction oxygen atom plus molecular oxygen (O2) plus M (1) yields vibrationally excited O3 plus M followed by vibrationally excited O3 plus M (2) yields O3 plus M with M equals O2 or nitrogen are described. The values are k subscript 1 equals 3 times 10 to the minus 34th power cm to the 6th power/sec, k subscript 2 equals 2 time 10 to the minus 14th power cu cm/sec, psi (v subscript 1) plus psi (v subscript 3) equals 1.6 and psi (v subscript 2) equals 3.7, where psi (v subscript 1) is the average number of quanta energy v subscript 1, resulting in mode v subscript 1 from each recombination (v subscript 1,2,3 equals 1103, 701, 1042/cm). This partitioning of the product energy accounts for 50% of the 25 kcal exothermicity of the recombination. The model used for interpretation is discussed. (Author abstract modified)

43941 **APTIC NO. 66953**

Seki, Naoko

A RESULT OF ACTINOMETRY ON ULTRAVIOLET RADIATION. *(Chijo rakka shigaisenryo no sokutei seiseki). Text in Japanese. Nippon Jidosha Kenkyujo Kenkyu Sokuho (Res. Lett. Japan Automob. Inst.), no. 19:37-61, March 1974. 2 refs.*

Continuous ultraviolet measurements were made with automatic integrating actinometers in Ibaraki, Japan at an elevation of about 40 m above sea level between the hours of 5 am and 7 pm daily. Considerable correlation appeared between ultraviolet and visible radiation, with the coefficients of mutual relation being 0.987 during July and December of 1973. High ratios of ultraviolet radiation to total solar radiation appeared in July, August, and September, with July being the highest; while lower ratios appeared in November, December, and January, with December being the lowest. Monthly total ultraviolet values changed similarly. The ultraviolet data recorded were lower than similar data recorded for Tokyo. This data will be used to determine the relationship between ultraviolet radiation and photochemical reactions in polluted air.

43942 **APTIC NO. 66926**

Simons, Wilhelm

DETERMINATION OF THE AIR-EXCESS COEFFICIENT FOR COMBUSTION IN ENGINES FROM THE ELEMENTAL ANALYSIS OF THE FUEL, AND THE CARBON MONOXIDE, CARBON DIOXIDE AND HYDROCARBON CONCENTRATIONS IN THE EXHAUST GAS. *(Ermittlung der Luftzahl bei der motorischen Verbrennung aus der Elementaranalyse des Kraftstoffes und den Konzentrationswerten von Kohlenmonoxid, Kohlendioxid und Kohlenwasserstoffen im Abgas). Text in German. TUE (Tech. Ueberwach), 15(9):303-305, Sept. 1974. 1 ref.*

Equations were developed for the determination of the air-excess coefficient for the measured carbon monoxide, carbon dioxide, and n-hexane equivalent concentrations in the exhaust gas and from the elemental analysis of the fuel without measuring the combustion air and fuel consumption. Modified equations are presented for the determination of the air-excess coefficient and the oxygen and nitrogen concentrations to compensate for changes due to the presence of hydrogen in the exhaust gas. The total nitrogen oxide concentration in the exhaust gas is negligible for the calculation of the air-excess coefficient.

43943 **APTIC NO. 66612**

Storozhilova, A. I. and G. I. Shcherbina

MEASUREMENT OF THE RATE OF THERMOPHORESIS OF LARGE AEROSOL PARTICLES AND APPLICATION OF THE RESULTS TO THE DETERMINATION OF THE THERMAL SLIP COEFFICIENT OF GASES. *(Izmereniye skorosti termoforeza krupnykh aerozol nykh chastits i primeneniye rezul tatov izmereniya k opredeleniyu koeffitsienta teplovogo skol zheniya gaza). Text in Russian. Doklady Akad. Nauk SSSR, 217(2):386-389, 1974. 14 refs.*

The rate of thermophoresis of large aerosol particles was measured by the vertical slot method, and the results obtained were used for the determination of the thermal slip coefficient of gases. For the measurement of the rate of thermophoresis, transformer oil droplets falling freely through a vertical slot with transversal temperature gradient were used. The droplets fell on a glass plate coated with dimethyldichlorosilane. The results obtained were in good agreement with those obtained by the jet method and those calculated from the modified Deryagin-Yalamov formula.

43944 **APTIC NO. 66936**

Tsuruga, Noriyoshi and Shogo Uchida

RECOVERY OF AMMONIA GAS BY SULFONYL DIAMIDE. *(Suruhoniru jiamido ni yoru anmonia gasu no kaishu). Text in Japanese. Nippon Kagaku Kaishi (J. Chem. Soc. Japan), no. 10:1888-1892, Oct. 1974. 7 refs.*

Recovery of ammonia by sulfonyl diamide supported on silicate columnar particles was studied, with absorption amounts and breakthrough curves being determined for ammonia-nitrogen gas mixtures containing 20, 30, and 60% ammonia at temperatures of 0, 10, and 20 C at a superficial linear gas velocity of 0.2-1.5 cm/sec. Ammonia was efficiently recovered by the absorption column in the anhydrous state, even at relatively low concentrations. Sulfonyl diamide-ammonia solution was also prepared by passing ammonia through the absorption column in which sulfonyl diamide-ammonia solution was about 0.09-0.11 P at 0-10 C.

43945 **APTIC NO. 66927**

Wayland, B: B. and Larry W. Olson

SPECTROSCOPIC STUDIES AND BONDING MODEL FOR NITRIC OXIDE COMPLEXES OF IRON PORPHYRINS. *J. Am. Chem. Soc., 96(19):6037- 6040, Sept. 18, 1974. 43 refs.*

Results are reported for spectroscopic studies of nitric oxide complexes of tetraphenylporphyriniron (III) chloride (FETPPCl) and tetraphenylporphyriniron (II) chloride. Nitric oxide reacts reversibly with Fe(III)TPPCl to form a complex which is spectroscopically examined in toluene solution, glass media, and Nujol mulls and found to be the diamagnetic NO complex Fe(II)TPP (Cl anion)(nitrosonium ion). The Fe(III)TPPCl in the presence of methanol reacts with excess NO to produce Fe(II)TPP(NO), with the reaction thought to proceed via the methanolysis of coordinated nitrosonium ion in the intermediate Fe(II)TPP(Cl anion)(nitrosonium ion) complex. The Fe(II)TPP(NO) complex has a doublet ground state with the odd electron in a molecular orbital and adds nitrogen donors in the sixth coordination position which have electron paramagnetic resonance spectra showing N-14 hyperfine from both nitrogen-bonded ligands. A second NO is reversibly coordinated by Fe(II)TPP(NO) to form FeTPP(NO)2 which on the basis of magnetic and spectroscopic properties is formulated as Fe(II)TPP(NO anion)(nitrosonium ion). Two N-O stretching frequencies are observed consistent with linear Fe(II)-nitrosonium and bent Fe(II)-NO anion units. Bonding models are presented from the NO complexes and generalized for related complexes of diatomic molecules. (Author abstract modified)

43946 **APTIC NO. 67174**

Weeks, R. W. and W. W. Duley

AEROSOL-PARTICLE SIZES FROM LIGHT EMISSION DURING EXCITATION BY TEA CO2 LASER PULSES. *J. Appl. Phys., 45(10):4661-4662, Oct. 1974. 4 refs.*

Preliminary measurements of time-dependent light emission from aerosol particles (generated from submicron powders of carbon black and alumina) during excitation with pulses from a TEA carbon dioxide laser showed that this emission may be simply related to particle size. Thus, the 10.6 micron laser pulses may be used in diagnostic studies of laboratory produced aerosols. (Author abstract modified)

43947 **APTIC NO. 66949**

Yoshizawa, Shiro and Akira Katagiri

THE CATALYTIC REACTION OF CARBON IN THE OXIDATION PROCESS OF SULFUR DIOXIDE. *(Nisanka io no sanka hanno ni taisuru tanso no shokubai sayo). Text in Japanese. Ryusan to Kogyo (Sulfuric Acid Ind.), p. 1-7, Aug. 1974. 31 refs.*

The desulfurization process using activated charcoal, which can be classified into several methods according to the recovery method of sulfuric acid adsorbed on activated charcoal and the type of activated charcoal adsorption layer, is reviewed. Recently reported studies on the oxidation adsorption of sulfur dioxide by activated charcoal including the kinetics of oxidation adsorption are discussed. The phenomena of dispersion of SO2 in micro-pores of activated carbon, catalytic oxidation on the inner surface of carbon, and the accumulation of reaction product H2SO4 are fairly well clarified. However, many questions on the reaction mechanism of catalytic oxidation and function of activity point remain. Studies on the chemical properties of activated charcoal and its catalytic effect are also reviewed. The electrochemical approach to the catalytic oxidation reaction of SO2 is discussed in reference to the electrochemical reaction mechanism and chemical equilibrium. The basic surface compound on the carbon surface is known to play an important role in the electrochemical reduction of O2, and the basic surface compound is reported to be the activity point of oxidation adsorption of SO2. In the case of the desulfurization process, the H2SO4 concentration produced on activated charcoal is 70-80%. Therefore, it is unlikely that the basicity on the carbon surface has the catalytic effect. It is presumed that a surface chemical structure similar to the basic surface structure is contributing to the catalytic effect of activated charcoal.

1973

43948 **APTIC NO. 66787**

Demerjian, Kenneth L., J. Alistair Derr, and Jack G. Calvert

THE MECHANISM OF PHOTOCHEMICAL SMOG FORMATION. *Advan. Environ. Sci. Technol., vol. 4:1-262, 1973(?). 219 refs.*

A review is presented on the mechanism of photochemical smog formation. Topics covered include: the photochemistry of sunlight-irradiated mixtures of clean air; the effects of added nitric oxide and nitrogen dioxide impurities on the mechanism of chemical reactions in a sunlight-irradiated clean atmosphere; the effects of carbon monoxide, hydrocarbon, or aldehyde additions on the chemistry of sunlight-irradiated NO- and NO2- containing atmospheres; computer simulation of the chemistry of some simple analogues to the sunlight-irradiated auto-exhaust- polluted atmospheres; and the selection and estimation of rate constants used for the reactions considered. Recommendations are given for improving the usefulness of data obtained from smog chamber runs.

43949 **APTIC NO. 67232**

Glebov, V. P., G. I. Motin, F. M. Yakhilevich, and A. K. Burnyshev

THE FORMATION OF SO3 IN THE COMBUSTION PRODUCTS OF HIGH-SULPHUR OIL UNDER THE ACTION OF CATALYTICALLY ACTIVE BOILER HEATING SURFACES. *Thermal Eng. (English translation from Russian of: Teploenergetika), 20(11):17-21, 1973. 11 refs.*

The formation of sulfate in the combustion products of high-sulfur oil was studied to provide information on the problem of low-temperature corrosion of the heating surfaces of boilers burning high-sulfur oil. The SO3 concentration in any section of the convective passes can be calculated depending on the design of the tube bundles, the load, the thickness of the deposits on the tubes of the convective surfaces, the excess air, the catalytic activity of the tube surfaces and the deposits, the sulfur content of the fuel, and other factors. A calculation of this type was carried out for the PK-41 gas/oil fired supercritical boiler when burning oil with 3% sulfur. The SO3 concentration over the path of the gases in the convective pass increases with an increase in the quantity of deposits on the surfaces. The increase in SO3 at the heating surface depends on boiler load. If the catalytic activity of the deposits is equivalent to iron oxide, a fall in boiler load from 100 to 70% leads to some increase in SO3 with clean surfaces and to a small reduction when deposits are present. With higher catalytic activity (vanadium pentoxide), a similar reduction in boiler load also leads to an increased SO3 concentration with clean heating surfaces and to practically no change when they are fouled. Even with a stoichiometric quantity of oxygen at the furnace exit, in the most catalytically active surfaces due to the leakage, conditions are created for conversion of the SO2 to SO3. When the boiler walls are not tight the leakage of air can prevent fully satisfactory results from the viewpoint of limiting SO3 formation. Satisfactory agreement was obtained between theoretical SO3 concentrations and experimental data. Designing boilers with allowance for the processes of SO3 formation leads to a reduction in overall SO3 concentration. Decreasing the number of rows of tubes with respect to the flow of gases in the convective bundles with a simultaneous increase in gas flow velocity and the use of single- stage superheating leads to reduction of SO3 concentration. An increase in thickness of deposits on the convective heating surfaces leads to an increase in SO3. The calculation method thus can be used to evaluate the relative effect of different structural and operational parameters on the SO3 concentration.

43950 **APTIC NO. 67168**

Hochrainer, D. and G. Zebel

SEPARATION OF AEROSOL PARTICLES BY DIFFUSING GASES. *(Zur Frage der Abscheidung von Aerosolteilchen durch diffundierende Gase). Text in German. Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 147-149. 3 refs. (Oct. 17-18.)*

Experimental study of the separation of aerosol particles from gaseous mixtures by diffusiophoresis, and the implications of this phenomena for particle separation in the lung are described. Two different gases with latex particles 0.82 micron in diameter were sent through parallel canals with a diaphragm filter between them in a diffusion chamber, after which the composition of the two gases was determined by means of Jamin helium-neon laser interferometer. In the case of equimolar counterdiffusion, the rates of aerosol separation on the carbon dioxide side in the CO2-oxygen, CO2-hydrogen, and CO2-air systems was higher than on the opposite side by 11, 61, and 5.3 times, respectively, which is indicative of the entrainment of the particles by the heavier gas. This implies inhibition of the particle separation by CO2 released by tissues in the lung. In the case of diffusion with equal pressure in the diffusion chamber, corresponding to a respiratory coefficient of 0.84, facilitation of the particle separation by diffusiophoresis was observed. The diffusiophoresis was much weaker in this case than during equimolar counterdiffusion. The effect of diffusiophoresis on particle separation in the lung is believed to be insignificant due to the very small concentration gradients occurring there.

43951 **APTIC NO. 67178**

Levy, Hiram

TROPOSPHERIC BUDGETS FOR METHANE, CARBON MONOXIDE, AND RELATED SPECIES. *J. Geophys. Res., 78(24):5325-5332, Aug. 20, 1973. 40 refs.*

A tropospheric photochemical model is presented that provides a homogeneous gas phase radical chain mechanism for the removal of tropospheric methane, carbon monoxide, molecular hydrogen, and formaldehyde. The chain reaction that destroys CH4 serves as the tropospheric source for CH2O, which in turn serves as the major source of tropospheric CO and H2. Simple relationships between CH4 and its destruction products are derived that give a surface mixing ratio for CO of 0.1 ppm, independent of the radical number densities. An upper limit of 1 ppb is obtained for CH2O mixing ratio. Detailed calculations of total column production and loss rates based on earlier calculated altitude profiles for the number densities of the hydroxyl radical and CH2O yield the following: a total column loss rate for CH4 of 4.5 times 10 to the 11 molecules/sq cm sec and a tropospheric residence time of 2 yr; a total column production for CO of 4.5 times 10 to the 11 molecules/sq cm sec, a tropospheric residence time of 0.1 yr (assuming the measured value of 0.12 ppm for CO mixing ratio), and a uniform mixing ratio of 0.07 ppm based solely on atmospheric destruction and production; and for H2, a 1.6 times 10 to the 11 molecules/sq cm sec column production, an 0.7 ppm uniform mixing ratio, and a 2-year tropospheric residence time. (Author abstract modified)

43952 **APTIC NO. 67021**

Pitts, James N., Jr. and Alan C. Lloyd

DISCHARGES INTO THE ATMOSPHERE. SOURCES OF NITROGENOUS COMPOUNDS AND METHODS OF CONTROL. *In: Nitrogenous Compounds in the Environment. California Univ., Riverside, Rept. SAB-73-001, Dec. 1973. 59 refs.*

The concentrations, sources, sinks, transformations, and the health and environmental effects of key nitrogen compounds in the lower atmosphere are reviewed. Both natural and anthropogenic sources are considered, as are those that are known or believed to play significant roles in the natural and polluted troposphere. Those compounds include nitric oxide, nitrogen dioxide, nitrous oxide, nitrous and nitric acid, ammonia; particulates containing nitrites, nitrates, and ammonia salts; and peroxyacetyl nitrate, and peroxybenzoyl nitrate.

43953 **APTIC NO. 66732**

Sigal, I. Y., Y. M. Lavrentsov, N. A. Gurevich, and S. S. Nizhnik

FORMATION OF NITROGEN OXIDES IN BOILERS OPERATING ON GASEOUS FUEL. *(Obrazovaniye okislov azota v kotlakh, rabotayushchikh na gazovom toplive). Text in Russian. Gaz. Prom., No. 11:35-38, 1973. 10 refs.*

The mechanism of the formation of nitrogen oxides in natural gas flames of boilers was studied. Nitric oxide was formed at temperatures over 1400 C and especially in the flame zone with the highest temperature, i.e., in the first one third of the length of the flame beyond with zone the NO concentration is not subject to any further change. The NO concentration in the combustion products is a function of the relation of the rate of combustion to the rate of heat transfer. It is possible to reduce the rate of NO formation of natural gas-fired boilers by adequate combustion chamber and burner design resulting in a reduction of the maximum temperature in the flame core.

43954 **APTIC NO. 66867**

Yamaguchi, Hiroshi

STUDIES ON THE EFFECTS OF AIR POLLUTANTS ON THE LUNG SURFACTANT (II). *(Lung Surfactant ni taisuru kuki osenshitsu no eikyo ni kansuru kenkyu). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 28(1):135, April 1973.*

Following experiments on the effects of nitrogen dioxide on lung surfactants, the effects of ozone were examined by experiments in vitro, using 10 mg/ml solution of lecithin. The air supply was filtered through filters, soda lime, silica gel, and an activated carbon layer to eliminate NO2 and other acidic gases, water, and hydrocarbons. With an air supply of 0.5 ml/m, an ozone concentration of 1 ppm was obtained. The ozone concentration was checked by phenolphthalin. After the O3 containing air was passed through the lecithin solution for 20, 40, and 60 min and in 50 C baths, water evaporation was completely eliminated and lecithin was distilled; the distillate was dissolved in chloroform (1 ml) and applied to infrared spectrophotometry. An increase of CO(carbonyl groups), a decrease of -CH3, (methyl groups) a decrease of -CH2 groups, the appearance of CNO groups, and increase of (CH2)2-N groups, and a slight decrease of phosphate were recognized. The separation of aliphatic acid composing lecithin molecules, the separation and decomposition of choline, decomposition of phosphate, and the formation of epoxy were suspected.

1972

43955 **APTIC NO. 66739**

Boffa, C. V. and E. Pfender

UTILIZATION OF A HIGH INTENSITY ARC FOR THE CONTROLLED GENERATION OF ULTRAFINE, MONODISPERSE AEROSOSLS (FINAL REPORT). *Minnesota Univ., Minneapolis, Heat Transfer Lab., Public Health Service Research Grant AP 01161-01 and AP 01161-02, HTL TR 106, 239p., May 1972. 88 refs.*

NTIS: PB 230086

A device is described for the generation of monodisperse aerosols of controlled size anywhere in the submicron range. A transpiration-cooled anode in a high intensity arc is used to continuously generate the aerosol by ablation of the anode material at the steady arc attachment spot which is the hottest part of the anode surface. The transpiring gas passing through the anode provides quenching of the vapor and immediate dilution of the generated particles in the vicinity of the anode surface, thus avoiding coagulation and formation of agglomerations. The device is suitable for generating aerosol particles whose mean diameter can be controlled in the range from 50 Angstroms to about 1 micron. (Author abstract modified)

43956 **APTIC NO. 67389**

Gidaspow, Dimitri

A FLUID-POROUS SOLID REACTION MODEL WITH STRUCTURAL CHANGES. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1159-1168. 24 refs. (Sept. 25-29, Paper 729173.)*

A continuum model for reaction of a fluid with a porous solid based on differential mass balances of the solid phases is proposed. This process is of interest in many energy conversion processes. The model predicts the frequently observed exponential decrease of rates of these reactions with time. A dimensionless group involving a ratio of molar volumes of the solid phases governs the predicted cases of pore closing or pore opening upon reaction. This group and initial fractions of solid phases form a criterion which tells the designer when a pore will close, leading to incomplete reactant utilization. In contrast to the behavior predicted by shrinking core and other conventional models, the reaction thickness decreased with time for the case when the pore ultimately closes. In other situations, the reaction zone moved into the slab of the porous solid. A high flux or suction effect present at high gas concentrations significantly increases the conversion of solid. (Author abstract)

43957 **APTIC NO. 66728**

Kopczynski, S. L. and R. L. Kuntz

REACTIVITIES OF COMPLEX MIXTURES OF HYDROCARBONS AND NOX. *Am. Chem. Soc., Div. Water, Air Waste Chem., Gen. Papers, 12(2):221, 1972. (Presented at the American Chemical Society, Division of Water, Air and Waste Chemistry National Meeting, 164th, New York, Aug. 28-Sept. 1, 1972.)*

Photochemical studies were performed on mixtures of hydrocarbons and nitrogen oxides in order to better predict the effects of various hydrocarbon and NOx emission controls in the real atmosphere. The hydrocarbon mixes consisted of acetylene, five paraffins, six olefins, and five aromatics in proportions found in the Los Angeles atmosphere. The hydrocarbon-NOx mixtures were reacted for 5.5 hr in a large irradiation chamber using ultraviolet fluorescent lamps at hydrocarbon concentrations of 5, 10, and 20 ppm and NOx concentrations of 1 ppm. Rate of oxidation of nitric oxide, nitrogen dioxide dosage, hydrocarbon consumption, eye irritation, and yields of peroxyacetyl nitrate, formaldehyde, and oxidant were measured, and the effects of changes in hydrocarbon composition and hydrocarbon concentration on the various measures of photochemical reactivity were evaluated.

43958 **APTIC NO. 66783**

Phillips, Warren F.

THE THERMAL FORCE ON SPHERICAL AEROSOL PARTICLES. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 725-735. 18 refs. (April 20-21.)*

The thermal force on spherical aerosol particles was investigated. Small dust particles, suspended in a gas, will tend to move out of the region close to a hot surface, showing that a temperature gradient affects the motion of aerosol particles. The thermal force per unit mass appears to increase as the size of the particle decreases. This makes the mechanism particularly attractive for the removal of very small particles which cannot easily be removed by the usual mechanisms such as gravitational and centrifugal precipitation. There is a possibility of designing a thermal precipitator which could efficiently remove very small aerosol particles if the thermal force is understood.

43959 **APTIC NO. 67390**

Viets, Hermann

VISCOUS ENERGY TRANSFER FROM A LAMINAR THREE-DIMENSIONAL JET. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1178-1184. 6 refs. (Sept. 25-29, Paper 729176.)*

A laminar jet issuing from a three-dimensional orifice of elliptical shape is analyzed by the use of the boundary layer assumptions in the mixing region of the jet. The full three-dimensional equations are reduced to a set of quasi-two-dimensional boundary layer equations. These equations are solved numerically and predict a decrease in the half width dimension of the major axis of the ellipse. This decrease has been observed in the case of three-dimensional turbulent jets, but has not been predicted by an previous analysis. (Author abstract)

EFFECTS-HUMAN HEALTH

1974

43960 **APTIC NO. 66925**

Aronow, Wilbert S.

EFFECTS OF CARBON MONOXIDE ON CORONARY HEART DISEASE. *Geriatrics, 29(10):141-142, 145-146, Oct. 1974. 17 refs.*

The effects of carbon monoxide on coronary heart disease are illustrated in a review of several studies involving the exposure of animals and humans to various concentrations of the gas. An association is cited between atmospheric carbon monoxide pollution in Los Angeles and mortality rates in patients with acute myocardial infarction admitted to 35 Los Angeles hospitals. Experiments with monkeys suffering from induced myocardial infarction show a greater degree of myocardial ischemia occurring in those exposed to 100 ppm CO than in those breathing room air. Patients with exercise-induced angina pectoris and exposed to heavy freeway traffic demonstrate mean arterial carboxyhemoglobin level increases from 1.12-5.08% after 90 min of driving; exercise time until the onset of angina pectoris is significantly shorter than during control periods. Ischemic S-T segment depressions of at least 1 mm greater amplitude than in control Holter electrocardiographic tracings are also observed in CO-exposed angina patients. Experiments are also cited linking carbon monoxide to the pathogenesis of coronary atherosclerosis and demonstrating the effect of smoking on carboxyhemoglobin levels.

43961 **APTIC NO. 66964**

Bates, David V.

PHYSIOLOGICAL EFFECTS ON MAN OF AIR POLLUTANTS. *Fed. Proc., 33(10):2133-2136, Oct. 1974. 14 refs.*

The physiological effects of air pollutants are reviewed. The average city contains 60-200 micrograms/cu m of particulates, compared to 10-20 micrograms/cu m in a rural area. The mass median diameter of the average city particle is about 0.4 micron. As particle size decreases from 0.5 to 0.01 micron in diameter, the pulmonary retention rate increases. Particles stimulate alveolar macrophages, have various effects depending on composition, and can increase respiratory disease. Mean annual sulfur dioxide levels vary between 0.01 ppm to 0.2 ppm; peak levels may reach more than 3 ppm for a few minutes. Effects include increasing airway resistance, increasing morbidity and mortality in polluted areas, and synergism with particulates. Generally, monthly nitrogen oxides averages may reach 0.2 ppm in special locations such as Southern California or 0.1 ppm elsewhere. Long-term effects at levels above 0.2 ppm have not been documented. Nitrogen oxides may have a relationship to respiratory disease morbidity. Long-term low level exposures to ozone appear to be less likely than peak exposures of short duration of up to 0.8 ppm. Ozone and other photochemical oxidants can cause eye and respiratory irritation. Urban air pollution (carbon monoxide) can increase carboxyhemoglobin in the blood by 0.6%, cigarette smoking by about 7%.

43962 **APTIC NO. 66626**

Chovin, P.

THE KINETICS OF THE FIXATION OF CARBON MONOXIDE IN THE BLOOD. III. *DOSE RECEIVED*

AND DOSE RETAINED. SIGNIFICANCE OF POLLUTION PEAKS. (Sur la cineuque de la fixation du monoxyde de carbone dans le sang. III - Dose recue et dose retenue. Importance des pointes de pollution). Text in French. Pollut. Atmos. (Paris), 16(62):179-181, April-June 1974. 7 refs.

The kinetics of the retention of carbon monoxide in the blood is discussed with respect to certain CO concentration standards. The ratio of the amount of CO retained by the blood to the amount inhaled is independent of the CO concentration in the inhaled air, and increases with decreasing in the exposure time. An exposure to 50 ppm CO for 8 hr causes a carboxyhemoglobin level of 5.5% corresponding to a retention rate of 31.5%, while exposure to the same concentration for 30 min results in a retention rate of 55%. With the dose inhaled being constant, the COHb level varies as a function of time, increasing with shortening of the exposure time, which emphasizes the hazards of high CO peaks in street air. Exposure to 40 ppm CO for 1 hr and to 10 ppm CO for 12 hr according to the California standard will result increases in the COHb level by 0.93% and 1.3%, respectively. The inconsistency of U. S. standards is further demonstrated by the great divergence between the safety factors calculated for exposure to the maximum allowable concentrations for the respective maximum allowable durations.

43963 **APTIC NO. 66697**

Cole, Jerome F.

RESEARCH FOR THE PROTECTION OF ENVIRONMENT AND HEALTH. *(Forschung fuer Umwelt- und Gesundheitsschutz). Text in German. Metallwirtsch. Metallmarkt, 28(9):918-920, Sept. 1974.*

The research work by ILZRO on thy effects of lead, zinc, and cadmium on environment and health is described. In the first years of ILZRO environment research, emphasis was placed on the determination of Pb concentrations in the atmosphere of urban and rural areas. One main project was the determination of the areal dispersion of Pb in five urban areas and two suburban areas. The results obtained was, that the areal dispersion seemed to be rather constant and independent of urban or rural surroundings. A study of the Pb enrichment in food grown close to busy highways revealed that atmospheric precipitation accounts for the enrichment. Life-long exposure of rabbits and guinea pigs to air drawn from a highway revealed higher Pb concentration in the skeleton than the control group, but the mortality and life expectancy was the same as that of the control group. The research work concerning Cd involved the study of the biological importance of Cd, extensive epidemiological studies and the study of the physical condition of workers exposed to Cd. Many years of research on Zn have revealed its great nutritional value.

43964 **APTIC NO. 66966**

Corridan, John P.

HEAD HAIR SAMPLES AS INDICATORS OF ENVIRONMENTAL POLLUTION. *Environ. Res., 8(1):12-16, Aug. 1974. 25 refs.*

Hair samples from primary schoolchildren (5-12 years of age) living in a rural area laden with particulates from the mining of zinc and copper and production of mercury and arsenic were analyzed for Cu, lead, As, Hg, and Zn to investigate the usefulness of head hair as an indicator of airborne metal pollution. Mean values for Cu, Pb, As, Hg, and Zn were 22.5, 3.1, 2.1, 0.48, and 149 ppm, respectively. The results were interpreted as being comparatively high for As, normal for Cu and Zn levels, and low for Pb and Hg. Head hair was a useful indicator for environmental pollution by metals.

43965 **APTIC NO. 66668**

Davydova, V. I. and Y. N. Pochashev

ON THE JOINT ACTION OF COMPOUNDS OF MANGANESE AND FLUORINE ON THE BODY. *(K voprosu o kombinirovannom deystvii na organizm soyedineniy margantsa i ftora). Text in Russian. Gigiena i Sanit., no. 7:21-25, 1974. 6 refs.*

The joint action of low concentrations of manganese dioxide and hydrofluoric acid in the air, a combination usually occurring during welding operations, was studied in albino rats and compared with the action of the individual components. The respective concentrations corresponded to the maximum allowable values or were 50% lower; 0.28 and 0.16 mg/cu m for MnO2, and 0.56 and 0.22 mg/cu m for HF. The animals were exposed for 2.5 to 3 hrs daily for 16 weeks. The joint action of MnO2 and HF on the animal organism was different from that of the individual compounds and potentiation as well as attenuation of the effects of the individual compounds were observed. Statistically significant differences from groups exposed to either MnO2 or HF were observed in such changes as increase of the relative weight of the lung, increased stain retention by spleen and adrenal tissues, reduction of the serum alkaline phosphatase activity, increase in the serum SH group level, and prolongation of the chronaxia. Also, premature damage of the dental enamel was observed. The maximum allowable MnO2 and HF concentrations in their joint action should be set at a level close to their respective MAC values, i.e., 0.15 mg/cu m for MnO2, and 0.25 mg/cu m for HF.

43966 **APTIC NO. 67183**

Epstein, Samuel S.

ENVIRONMENTAL DETERMINANTS OF HUMAN CANCER. *Cancer Res., 34(10): 2425-2435, Oct. 1974. 85 refs.*

Environmental determinants of human cancer are reviewed, with particular emphasis on chemical carcinogens. Topics covered include: the prevalence of human cancer, categorization of chemical carcinogens, quantitative and qualitative extrapolation from toxicological data, the alleged distinctions between species-specific carcinogens and between tumorigens and carcinogens, general epidemiological considerations, and an evaluation of the benefit-risk calculus. Chemicals of suspected or known carcinogenicity include: chlorinated hydrocarbon pesticides such as aldrin, dieldrin, and dichlorodiphenyltrichloroethane; polynuclear compounds such as benzo(a)pyrene and benzo(a)anthracene; bis(chloromethyl) ether; 2-naphthylamine; benzidine; 2-aminobiphenyl; 2-nitrobiphenyl; estrogens; and carbon tetrachloride. Occupational situations reported in connection with cancer incidence include: working with chimney soot, dye and rubber manufacturing, coal and metal mining, asbestos handling, and polyvinyl chloride manufacturing.

43967 **APTIC NO. 67235**

Foltz, Virginia C. and Robert Fuerst

MUTATION STUDIES WITH DROSOPHILA MELANOGASTER EXPOSED TO FOUR FLUORINATED HYDROCARBON GASES. *Environ. Res., 7(3):275-285, June 1974. 28 refs.*

Four fluorinated hydrocarbon gases (Freon C-318, perfluorobutene- 2, Genetron-23, and Genetron-152A) were administered to research stocks of Drosophila melanogaster to determine if each gas would be mutagenic under the experimental conditions. All data were subjected to statistical treatment using t-test analysis and/or Steven s test. The fluorinated hydrocarbons significantly increased mutation rates in progeny Drosophila over control levels. Genetron-23 appeared to be the most mutagenic of the gases. For each gas studied, pronounced phenotypic effects were observed among progeny of exposed males. While most of the deviant phenotypes found had been previously described in the literature, the fused medial unicorn antenna phenotype and two tumors were not described by Lindsley and Grell. Whether or not these phenotypes have a genetic origin was not determined. Although varying effects from each gas were noted, it was recognized that an undetermined part of the observed mutagenic effects of gases may be due to anoxia; this aspect warrents further investigation. The production of lethal mutations in the F2 generation and the increase of melanotic tumors in gas-exposed Drosophila strains would be more than sufficient reason to expand these studies to other gases, to other forms of living organisms, and to the establishment of further research in the field of mutagenic gas ecology. (Author abstract)

43968 **APTIC NO. 66702**

Fujii, Toru

PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu ni tsuite). Text in Japanese. Sumitomo Sangyo Eisei (Sumitomo Bull. Ind. Health), no. 10:1-12, 1974. 5 refs.*

The development and effects of photochemical smog are discussed based on a study made in Osaka. Atmospheric ozone was determined using the chemiluminescence method with ethylene. Hoarseness, cough, chest pain, and sore throat were more severe than that previously reported. Physical findings and clinical laboratory data correspond with initial symptoms. The relationship between weather conditions and the development of a high degree of photochemical oxidant was established based upon a comprehensive study of O3 concentration, weather, and a tracer test with sulfur hexafluoride.

43969 **APTIC NO. 66622**

Hofmann, Werner

PROBLEMS OF ENVIRONMENTAL PROTECTION AT THE APPLICATION OF SYNTHETIC RUBBER AND RUBBER CHEMICALS. *(Umweltschutzprobleme bei der Anwendung von Synthesekautschuk und Kautschukchemikalien). Text in German. Gummi Asbest Kunstst., 27(8):624-632, 1974. 12 refs.*

Toxicological problems of synthetic rubber and rubber chemicals are reviewed. The maximum allowable workplace concentration of benzene, a substance known to cause leukemia, has been set at 80 mg/cu m in the U.S.A., at 6 ppm in the USSR, and at10 mm in West Germany. The maximum allowable workplace concentrations of styrene are 210 mg/cu m in the U.S.A., and 5 mg/cu m in the USSR. The maximum allowable concentrations set for acrylonitrile, butadiene and cyclopentadiene in West Germany are 20 ppm, 1000 ppm, and 75 ppm, respectively. While synthetic rubber in itself is rated as rather harmless toxicologically, concomitant substances, such as residual monomers, solvent residues, and polymerization chemicals may be toxic. The maximum allowable workplace concentration of the toxic tetramethylthiuramdisulfide in particulate form is set at 5 mg/cu m, a concentration which is most unlikely to occur in practice. Both animal tests and observations on workers employed in the rubber industry indicate that there are no silicosis hazards involved in the use of amorphous silicic acid and silicates. In opposition to certain assertions, according to which aldol-alpha-naphthylamine resin is carcinogenic, statistical material covering workers exposed to this substance for over 30 yrs failed to demonstrate any such effect. Beta- naphthylamine, an impurity that may be present in phenyl-beta- naphthylamine in minute quantity depending on the actual production process, was found to cause bladder tumors after exposure for over 20 yrs. None of the rubber chemicals used currently were found to have mutagenic or psychotoxic effect.

43970 **APTIC NO. 66909**

Lawther, P. J., A. G. F. Brooks, P. W. Lord, and R. E. Waller

DAY-TO-DAY CHANGES IN VENTILATORY FUNCTION IN RELATION TO THE ENVIRONMENT. PART III. FREQUENT MEASUREMENTS OF PEAK FLOW. *Environ. Res., 8(1):119-130, Aug. 1974. 10 refs.*

Daily variations in peak expiratory flow measurements were recorded in two normal subjects and two bronchitic subjects before and after their daily journey to work. Some correlation between change in peak flow on entering the urban work area each morning and sulfur dioxide concentration at the time appeared for one of the normal subjects, but in both normal subjects the main feature was a consistent diurnal variation. Respiratory infection was the main factor causing reductions in the daily mean peak flow, while stress led to some increases in values. A relationship between the peak flow values at the end of the working day and SO2 concentrations (serving as a general pollution index) appeared for one of the bronchitic subjects, though the relationship disappeared when the clinical condition of the subject changed. No consistent relationship with pollution was observed with results from the other bronchitic subject. (Author abstract modified)

43971 **APTIC NO. 67181**

Lyster, W. R.

ALTERED SEX RATIO AFTER THE LONDON SMOG OF 1952 AND THE BRISBANE FLOOD OF 1965. *J. Obstet. Gynaecol. Brit. Commonwealth, 81(8):626-631, Aug. 1974. 9 refs.*

Observations of altered sex ratio of births after the London smog of 1952 are presented and compared with altered sex ratios observed after a flood incident in Brisbane, Australia. Drops in number of male births are recorded in each instance after about the same time period following the environmental disturbances, viz., 320 days. Stillbirths have a significantly more masculine sex ratio than livebirths; and excluding stillbirths, the reduced masculine to femine sex ratios after smog and soft water flood incidents appear even more reduced. Hypotheses concerning the effects of environmental stress and dietary soft water intake on Y-bearing spermatozoa and the condition of various stages of embryonic development are discussed.

43972 **APTIC NO. 66942**

Piver, Warren T.

POTENTIAL DILEMMA: THE METHODS OF MEETING AUTOMOTIVE EXHAUST EMISSION STANDARDS OF THE CLEAN AIR ACT OF 1970. *Environ. Health Perspect., vol. 8:165-190, 1974. 46 refs.*

An overview is presented on the interconnected industrial changes associated with compliance with the automobile exhaust emission standards of the 1970 Clean Air Act and possible health consequences of fuel and control device alternatives. The function of various fuel additives is reviewed with particular attention to lead. The use of gasolines with a higher percentage of aromatics as an alternative for leaded fuels which poison catalytic converter surfaces is estimated to be capable of resulting in the production of 1000 lb/yr of carcinogenic material from catalytic exhaust systems and about 200,000 lb/yr for uncontrolled exhaust systems. Methylcyclopentadienylmanganese tricarbonyl is an effective replacement antiknock compound for tetraethyl lead, though studies with a similar compound, cyclopentadienylmanganese tricarbonyl, indicate toxicity in laboratory animals. Serious consideration must be given to the ability of the general population to tolerate chronic exposure to higher projected atmospheric levels of manganese and higher levels of sulfates as a result of using manganese antiknock additives. Catalytic converters will also directly result in an increase in sulfur trioxide emissions, subsequently hydrolyzed to sulfuric acid mists.

43973 **APTIC NO. 66608**

Ploton, L., D. Settelen M. Colin, and D. Gonin

PSYCHOLOGICAL REACTIONS TO POLLUTION. *(Reactions psychologiques a la pollution). Text in French. J. Eur. Toxicol., 7(1):67-71, Jan.-Feb. 1974. 8 refs.*

Psychological reactions evoked by environmental pollution in general and air pollution in particular are discussed. Air pollution, in so far as perceptible for the organs of sense, evokes fears of asphyxiation and of deprivation of the vitally important air, while malodorous emissions, whether physiologically harmful or not, may generate psychic reactions independent of their physical and biological effects. Air pollution and environmental pollution in general are least tolerated by the individual in cases when such nuisances are not counterbalanced by apparent benefits of the pollution-generating activity, such as in the case of industrial emissions. Also, industry is seen by citizens as a foreign body within the limits of urban areas.

43974 **APTIC NO. 66935**

Rall, David P.

REVIEW OF THE HEALTH EFFECTS OF SULFUR OXIDES. *Environ. Health Perspect., vol. 8:97-121, 1974. 113 refs.*

The results of a cooperative study undertaken by the Department of Health, Education, and Welfare and the Environmental Protection Agency on the health effects of sulfur oxides are presented. Topics covered include cause and effect relationships between SOx exposure and adverse health consequences, agreement between experimental and clinical studies and epidemiologic data, varying susceptibility for different population groups, exposure- response relationships and cost relationships between SOx exposure and impaired health. Cause and effect relationships appear to exist at ambient air concentrations of SOx somewhat above the current standards in the United States, perhaps at twice the current standards. Clinical, laboratory, and experimental studies at relatively high concentrations of SOx in ambient air are consistent with current epidemiologic data. Studies on laboratory animals and human volunteers indicate that inhalation of sulfur dioxide alone does not affect lung function at concentrations 10-100 times that commonly found in ambient air, though mixtures of SO2 and particulates can be more toxic than SO2 alone. People aged 45 and over with chronic diseases, particularly of the lungs and heart, seem to be predominantly affected. Acute respiratory infections in children and decreased levels of ventilatory lung function in both children and adults appear to be related to concentrations of SO2 and particulates. It is currently not possible to state a concentration below which such health effects will not occur.

43975 **APTIC NO. 66891**

Saito, Kazuo and Eimatsu Takakuwa

STUDIES ON GASOLINE INTOXICATION. PART 2. GASOLINES CONTAINING TETRAETHYL LEAD AND ORGANIC SOLVENTS BESIDES TETRAETHYL LEAD. *(Gasorin no dokusei ni kansuru kenkyu). Text in Japanese. Sangyo Igaku (Jap. J. Ind. Health), 16(1):3-10, Jan. 1974. 9 refs.*

Electrocorticograms of 39 white male Wistar rats with implanted bipolar electrodes on the frontal and occipital lobes of the brain were recorded one day before and 1, 2, 3, 4, 5, 7, and 10 days after intraperitoneal injections of gasoline containing tetraethyl lead or gasoline containing tetraethyl lead plus the organic solvents benzene, toluene, and xylene in order to investigate the relative toxicities of the two gasoline types. Both gasolines induced slowed movements, crouched posture, and absence of reaction to stimuli, but the gasoline with organic solvent additives caused delirium and death within 2 days after injection; almost all of the rats receiving the non-organic solvent gasoline with lead were alive after two days. The basic rhythm and amplitude of the electrocorticograms from both groups decreased, with more marked reactions being observed in rats receiving the organic solvent gasoline. High voltage fast waves, arhythmic patterns, and a combination of slow and fast waves were observed in rats seriously affected by the gasoline with organic solvent additives.

43976 **APTIC NO. 67260**

Schlipkoeter, H. W., Georg G. Fodor, Friedrich Pott, Michael Wagner, and Gerhard Winneke

EEC REPORT. STUDY OF ENVIRONMENTAL POLLUTION AND ENVIRONMENTAL INJURIES BY TRAFFIC IN URBAN AREAS - NOISE AND EXHAUST GASES. II.2. STUDY OF THE PSYCHOLOGICAL AND PHYSIOLOGICAL EFFECTS OF AUTOMOBILE EXHAUSTS ON THE POPULATION IN URBAN AREAS. *(EG-Enquete. Untersuchung der Umweltbelaestigung und Umweltschaedigung durch den Strassenverkehr in Stadtgebieten - Laerm und Abgase. II.2. Untersuchung ueber die psychologische und phyiologische Auswirkungen von Autoabgasen auf die Bevoelkerung in Stadtgebieten). Text in German. Duesseldorf Univ. (West Germany), Medizinlisches Inst. fuer Lufthygiene und Silikoseforschung, and VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Laermminderung and Kommission Reinhaltung der Luft, 175p., 1974. 255 refs.*

Emissions from automobiles exert a negative effect on the human physical condition through the toxicity of the emitted pollutants, through the synergistic effect of several pollutants, and through secondary conversion in the atmosphere to new harmful substances. It is particularly difficult to comprehend the chronic effect of pollutants constantly present in small concentrations. It is therefore assumed that the physical condition is then affected by emissions from automobile exhausts if organic or functional changes significantly exceed the natural range of variation. For avoidance of adverse effects on the human physical condition, particularly on children and elderly and sick people even at long-term exposure, maximum allowable emission concentrations are recommended for the major components of the automobile exhausts. For carbon monoxide the recommended limit values are 10 mg/cu m for long-term (24-hour) exposure and 35 mg/cu m for short-term (30-minute) exposure. For nitrogen dioxide the 24-hour limit is 0.1 mg/cu m, and the 30-minute limit is 0.2 mg/cu m. For nitric oxide the respective limits are 0.5 mg/cu m and 1.0 mg/cu m. For lead the recommended limits are 0.001 mg/cu m and 0.010 mg/cu m. For oxidants limits of 0.05 ppm and 0.15 ppm are recommended. Limits for hydrocarbons are also given.

43977 **APTIC NO. 66690**

Settelen, D., L. Ploton, V. Vincent, L. Roche, E. Abrigeon, P. Isoard, R. Fontanges, D. Germain, A. Casset, and J.-M. Rouzioux

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON HUMAN HEMATOLOGIC CONSTANTS. *(Influence des conditions d environnement sur les constantes hematologieus humaines). Text in French. J. Eur. Toxicol., 7(1):46-62, 1974. 4 refs.*

Blood cell counts were evaluated as a possible biometric index for air pollution monitoring. Complete blood counts were made on 3030 blood samples from subjects living in different types of environments (rural area, industrial area, and the city of Lyon). Computerized data processing revealed an influence of the type of environment on a number of hematological parameters; mainly on red blood cells and packed cell volume, and to a lesser extent, on eosinophilic granulocytes, small lymphocytes, and monocytes. The mean corpuscular volume was lower in the male population in the urban environment than it was in a comparable population in industrial and rural environments, whereas the reverse phenomenon was observed among females. The mean cell volume was lower in urban males than in other male populations, while it increased in the female population in Lyon. The large lymphocyte count was higher in rural males than in males in urban and industrial environments, but it was lowest among urban females within the entire female population tested.

43978 **APTIC NO. 67182**

Smith, Ivan C., Bonnie L. Carson, and Thomas L. Ferguson

OSMIUM: AN APPRAISAL OF ENVIRONMENTAL EXPOSURE. *Environ. Health Perspect., vol. 8:201-213, Aug. 1974. 49 refs.*

Environmental exposure to osmium is reviewed in terms of major industrial sources and commercial uses, amounts of osmium compounds dispersed in the environment, and the toxicity of such compounds to humans. Copper refining is the chief source of osmium, with 1000-3000 oz troy of the metal being lost each year to the environment as the toxic, volatile tetroxide from copper smelters. Although the toxicity of osmium tetroxide is well recognized, the relatively small amounts of the compound in wastewater and air are assessed to pose no health hazard to man or the environment. The chief acute toxic effects of osmium tetroxide include eye and respiratory tract damage. Few data are available on possible effects of nonacute exposure to osmium. Workers continually exposed to osmium tetroxide vapors and rheumatoid arthritis patients receiving intra-articular injections of osmic acid solutions show no apparent damage from low-level exposures. (Author abstract modified)

43979 **APTIC NO. 66701**

Tsuchiya, Kenzaburo

BIOLOGICAL RESPONSES TO LOW LEAD EXPOSURES. *(Teinodo-en bakuro to seitai hanno). Text in Japanese. Sumitomo Sangyo Eisei (Sumitomo Bull. Ind. Health), no. 10:13-23, 1974. 37 refs.*

The toxicological effects of exposure to low concentrations of lead are reviewed. Six subjects are considered: dynamics and pathways of Pb in the environment and transfer to man; accumulation and excretion in man with special reference to the biological half time of Pb; indicators of body burden of Pb; relationships between biological responses; the dispute concerning health effects of airborne Pb in the United States; and biological responses to low Pb exposures. The ideal threshold limit value of Pb in working environments is 30 micrograms/cu m. This concentration increased Pb concentrations in blood up to 50 micrograms/100 g.

43980 **APTIC NO. 66615**

Vozovaya, M. A.

DEVELOPMENT OF POSTERITY OF TWO GENERATIONS OBTAINED FROM FEMALES SUBJECTED TO THE ACTION OF DICHLOROETHANE. *(O razvitii potomstva dvukh pokoleniy, poluchennykh ot samok, podvergavshikhsya vozdeystviyu dikhloretana). Text in Russian. Gigiena i Sanit., no. 7:25-28, 1974. 4 refs.*

The effect of inhaled dichloroethane on reproduction was studied in pregnant albino rats and the two subsequent generations. Female rats were exposed to a dichloroethane concentration of 57 mg/cu m for 6 days weekly 4 hrs a day for 6 or 9 mo, including the entire period of pregnancy. While no symptoms of general toxicity were observed in the pregnant rats, reduced fertility, reduced weight at birth, and increased stillbirth rate were determined. Reduced viability and retarded gain in weight were observed in the first generation obtained from the exposed males. Prolonged periods of heat occurred among females in the first generation. No deviations other than increased perinatal mortality were observed in the second generation. Female workers should not be exposed to dichloroethane during their pregnancies.

1973

43981 **APTIC NO. 66903**

Araki, Shunichi

ON THE BEHAVIOR OF ACTIVE DEPOSIT OF LEAD (TEISINGER) IN THE JAPANESE FREE FROM OCCUPATIONAL EXPOSURE TO LEAD. *Ind. Health (Japan), 11(4):203-224, Dec. 1973. 41 refs.*

Intravenous infusion of calcium disodium ethylenediamine tetraacetate (CaEDTA) was given to 45 Japanese adults without occupational exposure to lead for 1 hr at a dosage of 20 mg/kg body weight in 250 ml of 5% glucose solution. The urinary excretion of lead was estimated for 24 hr before, and for 2 hr and 24 hr after the administration. The least variation of the lead content was recognized in the 24-hour urinary excretion after the injection of CaEDTA.. No sexual difference was noted in the creatinine-corrected lead concentration. By multiple linear regression and correlation analyses, age was found to be significant in determining positively the lead level mobilized in 24-hour urine samples. Height was significant in determining positively the spontaneous 24-hour urinary lead excretion. Certain significant correlations existed among lead in blood, delta-aminolevulinic acid dehydratase in erythrocytes, delta-aminolevulinic acid in urine, coproporphyrin in urine, lead in urine, and lead mobilized by CaEDTA. The existence of active body burden of lead was suggested in human subjects under usual urban conditions where the total ambient lead concentration averaged 1.7 micrograms/cu m of air. Based on a few assumptions, it was calculated that about 3 micrograms of lead was retained on the average per day by a Japanese adult. Daily retention of lead by Japanese adults was formularized as lead in micrograms equals a constant (K) times daily creatinine excretion in grams, where K is 1.77 in men and 2.73 in women. (Author abstract)

43982 **APTIC NO. 67167**

Cinkotai, F. F.

THE BEHAVIOR OF THE TIDAL-RESIDENTIAL INTERFACE IN A MODEL ALVEOLAR SAC. *Gesellschaft fuer Aerosolforschung, Aerosole in Physik, Medizin und Technik, Kongressbericht der Aerosoltagung im Taunus-Sanatorium, Jahreskongress, Bad Soden, Germany, 1973, p. 132-136. 34 refs. (Oct. 17-18.)*

The behavior of the tidal-residential interface in the alveolar region of the human lung was studied using a simple latex model of an alveolar sac filled with viscous silicone fluid. The model was rhythmically expanded and contracted to imitate the alveoli of the lung. The time and volume parameters of the expansion and contraction were chosen to maintain Reynold s number in the model at the alveolar value. Dyed layers injected into the model to visualize the tidal-residential interface were preserved from one cycle to another only if the model expanded and contracted a series of geometrically similar shapes. Assuming this applies to alveolar airflow, unless the alveolar region expands and contracts perfectly uniformly during breathing, the tidal and residential phase will mix. The deposition of small (0.1-1 micron) aerosol particles into the alveolar region of the lung depends not on their size, but on the extent of phase mixing. (Author abstract modified)

43983 **APTIC NO. 66833**

Henry, Mary C., Curtis D. Port, Richard R. Bates, and David G. Kaufman

RESPIRATORY TRACT TUMORS IN HAMSTERS INDUCED BY BENZO(A)PYRENE. *Cancer Res., vol. 33:1585-1592, July 1973. 16 refs.*

Benzo(3-4)pyrene prepared as a colloid suspension of fine particles in a gelatin-sodium chloride solution, was administered by intratracheal instillation to 50 male and 50 female Syrian golden hamsters receiving a total dose of 111 mg over an 8-week period. The carcinogen induced respiratory tumors in 26 of 65 hamsters examined, with the tumors including squamous cell and anaplastic carcinomas, adenocarcinomas, fibrosarcomas, adenomas, polyps, and papillomas. Each segment of the respiratory tract, with the exception of the bronchi, showed a similar incidence of tumors. Only two tumors were diagnosed in the bronchial region. Rate of clearance of BP from the lung after a single administration was dependent on the dose of the carcinogen. Low doses of BP were cleared rapidly while the weekly doses instilled in the present study were retained for a long time.

43984 **APTIC NO. 66800**

Ho, W. and A. Furst

INTRATRACHEAL INSTILLATION METHOD FOR MOUSE LUNGS. *Oncology, vol. 27:385-383, 1973. 13 refs.*

An intratracheal instillation technique was developed which permits repeated administrations of precise volumes of particulate suspension into mouse lungs. Benzo(a)pyrene (BP) adsorbed to ferric oxide was used to test the feasibility of the method. The majority of the animals survived four weekly treatments. Histological and fresh tissue sections showed extensive penetration of both chemicals into the lung parenchyma; however, while BP was eliminated from the organ rapidly, the ferric oxide was retained for over 100 days. These particles were observed inside macrophages collected around terminal bronchioles and lymphoid tissues of the lungs. (Author abstract)

43985 APTIC NO. 66744

Hutchinson, T. C.

LEAD POLLUTION, THE AUTOMOBILE AND HEALTH. *Toronto Univ., Toronto (Canada), Dept. of Botany and the Inst. of Environmental Sciences and Engineering, Rept. EF-5, 11p., March 1973. 17 refs.*

The problem of lead pollution from automobile exhaust is reviewed in relation to health. The Pb emitted from exhausts is in the form of very finely divided particulate matter, with 62-80% of the particles being less than 2 micron in diameter. The average length of time that such particles remain suspended in the atmosphere is about one month. One liter of Pb-containing gasoline which is combusted in an automobile engine is theoretically enough to contaminate 130,000 cu m of air for one month to a level of 3 micrograms Pb/cu m of air. A human circulates 450 cu m/mo of air, and thus one liter of gasoline is enough to contaminate pure air for about 300 persons. Average city air in the United States contains 3-6 micrograms Pb/cu m of air. Fifty percent of the Pb which is inhaled is absorbed as compared to 10% absorption for ingested Pb. Lead poisonings among animals at the Staten Island zoo which were attributed to air pollution are reviewed along with research on the relation between neuropsychic metal disorders and lead susceptible age groups of humans.

43986 APTIC NO. 67001

Lende, R. van der, B. F. Visser, J. Wever-Hess, G. J. Tammeling, K. de Vries, and N. G. M. Orie

EPIDEMIOLOGICAL INVESTIGATIONS IN THE NETHERLANDS INTO THE INFLUENCE OF SMOKING AND ATMOSPHERIC POLLUTION ON RESPIRATORY SYMPTOMS AND LUNG FUNCTION DISTURBANCES. *Pneumonol. (Berlin), 149(2):119-126, 1973. 3 refs.*

Results of epidemiological cross-sectional studies of chronic nonspecific lung diseases in the Netherlands suggested that the exogenous factors of smoking and atmospheric pollution have an effect on chronic production of phlegm. The survey was carried out on a random sample of men and women residing in a rural area and in an area with severe air pollution. The residents were given various lung function tests, intracutaneous allergy tests, sputum and chest radiography tests, and a questionnaire. Smoking and pollution seemed to have no effect on bronchial obstruction, except in one subgroup of men, in whom there was a relationship between the exogenous factors and the prevalence of dyspnoea, although no relationship was found between these factors and impairment of forced expiratory volume. Reasons for the findings, results, and implications are discussed. (Author Abstract modified)

1972

43987 APTIC NO. 66716

Biersteker, K. and R. L. Zielhuis

AIR POLLUTION AND HEALTH. *(Luchtverontreiniging en gezondheid). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 76-93. 25 refs.*

Effects of air pollution on human health are surveyed. While several air pollutants, especially malodorous ones, deteriorate the well-being regardless of harmfulness, aggressive air pollutants may cause health hazards due to acute or chronic effects. As demonstrated by the high morbidity figures obtained for periods of high pollution levels, high concentrations of such air pollutants may be fatal or may deteriorate the prognosis of preexistent affections, especially in patients with tuberculosis, lung cancer, cardiac insufficiency, hypertension, pneumonia, influenza, bronchitis, and other respiratory diseases. The long-term effects of air pollutants may be due to accumulation in the lungs, as in the case of beryllium, quartz, and asbestos. The incidence of nonspecific respiratory diseases was found to be higher in urban and industrial than in rural areas, as is that of lung cancer, which, however, is also influenced by smoking habits. Carbon monoxide was found to inhibit the metabolism of 3,4-benzo(a)pyrene in the organism.

43988 APTIC NO. 67316

Kasprzak, Kazimierz Stanislaw and Leszek Marchow

THE CARCINOGENIC ACTION OF NICKEL SULPHIDE--NI3S2. *(Rakotworcze dzialanie siarczku niklu--Ni3S2). Patol. Polska (Warsaw), 23(2):135-142, 1972. 49 refs. Translated from Polish. Leo Kanner Associates, Redwood City, Calif., 10p., Jan. 1973.*

The current staty of research on the carcinogenic action of nickel sulfide and other nickel compounds is described, based on the literature, with particular attention to the usefulness of Ni3S2 for the induction of skeletal muscle neoplasms. Persons occupationally exposed to nickel compounds can suffer from lung, nose, and other tumors. The environment is becoming contaminated with nickel because of increased industrialization and motor vehicle use. Nickel carbonyl contained in internal combustion engine exhaust acts carcinogenically on rat lung tissue. Nickel carcinogenesis in humans is characterized by a long latency period, lasting even beyond 20 years of chronic exposure. The susceptibility of rats and mice by species to nickel sulfide is described. Nickel sulfide intramuscularly injected most often induces two kinds of tumors - transversely striated sarcoma and fibrosarcoma. Studies on the metabolism of Ni3S2 are also mentioned.

43989 APTIC NO. 67318

Nakayama, Y.

TRUE FUNGI AND ALLERGIES. *(Shinkin to arerugi). Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 9(7):[illegible], 1972. 14 refs. Translated from Japanese. Translation Consultants, Ltd., Arlington, Va., 26p.,*

True fungi and allergies are discussed, principally the relationship between juvenile bronchial asthma and airborne true fungi. Results of intradermal reaction tests for juvenile bronchical asthma using five types of true fungus antigens, of inhalation induction tests, of a study of the distribution of airborne true fungi in Tokyo, of several case studies of true fungi hypersensitivity asthma, and of other studies are presented. Among the types of bronchial asthma in infancy, approximately 20% is caused by hypersensitivity to true fungi. The principal type of true fungus is the Alternaria antigen; Cladosporium, Penicillium, and Aspergillus are also involved. The problem in the delayed allergic reaction is the Candida antigen. Desensitization treatment using true fungus hypersensitivity asthma. In general, discipline treatment and environmental improvement are also important. An environment with a good flow of air and sunlight is important for preventing asthma attacks; one of the methods of reducing seizures is to provide air cleaners, depending on the occasion, in the bedroom. True fungi are the next most important antigen to house dust as a cause of asthma in a high temperature, damp environment. The classifications and size of spores of true fungi are described.

43990 APTIC NO. 66710

Peters, H.

THE ENVIRONMENT. *(Het milieu). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair 1972, p. 3-10. 9 refs.*

Relationships of the living organism to its environment, and physical, physicochemical, chemical, and biological factors of the environment which influence the living organisms and their relationship to their environment are discussed. The optimum relationship between the living organism and its environment, i.e., the health or well-being of the former, is interfered with by the presence in the air of solid, liquid, or gaseous substances which in themselves or in combination with other substances are not natural constituents of air. Air is polluted when it contains foreign constituents or has the natural ratio of its constituents changed to the extent that disadvantageous consequences or damages for the living organisms will derive. While the acceptable ratio of nitrogen in the air is determined by the oxygen pressure required for respiration, the presence of even small concentrations of carbon monoxide is harmful for the human organism due to its replacing oxygen in hemoglobin.

43991 **APTIC NO. 67336**

Saito, Y.

THE EPIDEMIOLOGY OF POLLEN. *(Kafun no Ekigaku). Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 9(7):7-14, 1972. 7 refs. Translated from Japanese. Translation Consultants, Ltd., Arlington, Va., 27p.*

The relationship of pollen to allergy and the history of pollinosis are reviewed. For pollen to be a source of pollinosis the pollen must be antigentic and from an anemophilous flower, it must be produced in large quantities, must be light enough to be dispersed for long distances, and the plant which produces this flower must grow densely over an extensive area. Characteristics of airborne pollen, the mechanism of pollen inhalation, the measurement and sampling methods for airborne pollen, and field measurements of pollen in Japan are discussed. Plants which can cause pollinitis, the pollen of the Cryptomeria japonica plant, pollinitis from the Gramineae plant, and the pollens from the Compositae and Moraceae plants are also discussed.

43992 **APTIC NO. 67317**

Shida, T.

ALLERGIES AND AIR CLEANING. *(Arerugi to kuki seijo). Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 9(7):2-6, 1972. 20 refs. Translated from Japanese. Translation Consultants, Ltd., Arlington, Va., 18p.*

The basics for allergic reactions are discussed. Allergic diseases can be classified as Type I (bronchial asthma, hives, nasal allergies, gastrointestinal allergies, hypersensitivity to drugs, and reactions to antigens such as pollen, fungi, and household dust), Type II (in which antibodies act on antigen present in the cell wall and the basement membrane activating the lysozyme and causing damage to the cell), Type III (damage to tissue caused by antigen-antibody complexes, the immune complexes), and Type IV (delayed reactions in which tissue damage caused by reactions between antigens and lymphocytes having cell antibodies and special receptors in the cell walls occurs). The correlation between asthma attacks and air pollution is described. Air cleaning can be used to treat asthma and allergies. It can be used to eliminate naturally generated exogenous antigens as well as air pollution.

1971

43993 **APTIC NO. 67338**

Battigelli, M. C.

BIOLOGICAL SIGNIFICANCE OF NITROGEN OXIDES. *In: Medical Aspects of Air Pollution; a Continuing Engineering Education Course. Society of Automotive Engineers Inc., New York, SAE Engineering Education Activity, p. 10-19, 1971 (?). 29 refs.*

The biological significance of nitrogen oxides is reviewed based on data from animal experiments and observations on exposed humans. The most frequently occurring of the NOx family are nitric oxide and nitrogen dioxide which can be measured in metropolitan areas at respective average concentrations of 0.06 and 0.03 ppm. The untoward effects of NO at concentrations reported in the literature for city ambient air are essentially unknown, although it is generally accepted that respiratory symptoms are not to be expected from exposure to this chemical. Nitrogen dioxide, the best-known member of the NOx family regarding its biological effects, is capable of inducing changes in the structure of the small bronchi and alveoli of rats at continuous concentrations of 0.8 ppm, suggesting an effect compatible with certain features of human emphysema. Studies of populations (schoolchildren) exposed to NO2 at levels ranging below peak values of 0.25 ppm, with the means oscillating around 0.06-0.101 ppm indicate a decrease in respiratory performance and a high frequency of respiratory illnesses. Animal experiments indicate a synergistic relationship between NO2 and particulate air contaminants.

43994 **APTIC NO. 66819**

Brockhaus A., R. Tomingas, W. Dehnen, F. Pott, and E. G. Beck

THE FATE OF CARCINOGENIC HYDROCARBONS IN THE LUNGS. *(Das Verhalten kanzerogener Kohlenwasserstoffe in der Lunge). Text in German. Praxis Pneumol., 25(9):519-526, 1971. 9 refs.*

The behavior of carcinogenic hydrocarbons in the lungs was determined. Airborne polycyclic hydrocarbons are inhaled along with dust. Approximately 50% are deposited in the lungs where the macrophages separate the benzpyrene from the dust. The extent and rate of removal of benzpyrene partly depends on the particle size of the dust. The concentration of benzpyrene is comparatively low and is metabolized by the alveolar macrophages. The rate of breakdown may be adversely affected by other hydrocarbons, the quantity of smoke and dust in the atmosphere, and by extensive lung damage.

43995 **APTIC NO. 67325**

Marier, J. R. and Dyson Rose

ENVIRONMENTAL FLUORIDE. *National Research Council of Canada, Ottawa (Canada), Pub-12,226, 1971 (?), 39p. 168 refs.*

A review is presented on fluoride contamination of the environment. Topics covered include: the occurrence of fluoride in the soil, water, air, vegetation, terrestrial mammals, wildlife, ocean water, seafood, and man; sources and sinks of fluoride pollution; fluoride contamination of vegetation; the effects of fluoride on animals; and the effects of fluoride on man, including sources and doses, analysis and diagnosis, toxic effects, and intaky of highly toxic organofluorides. Airborne fluoride is of two types, gaseous and particulate, each of which can contain components differing in solubility. Fluoride released as particulate matter tends to deposit as fallout in the general downwind vicinity of fluoride emitting source. Depending on the type of industrial operation, a factory-stack effluent is estimated to contain from 3.6-15,600 mg/Fl, with the gaseous phase representing anywhere from 0.7-96%. Skeletal fluorosis is the most common toxic effect of fluoride exposure, though other disorders such as anemia and symptoms involving the skin, eyes, gastrointestinal tract, and nervous system are also reported.

43996 **APTIC NO. 67339**

Smith, Ralph G.

HEALTH ASPECTS OF ATMOSPHERIC EXPOSURE TO LEAD. *In: Medical Aspects of Air Pollution; a Continuing Engineering Education Course. Society of Automotive Engineers, Inc., New York, SAE Engineering Education Activity, p. 53-66, 1971 (?). 21 refs.*

The environmental effects of airborne lead are reviewed, with particular emphasis on the metal s toxicity to humans. Topics covered include: sources of lead in the environment, the relationship between amount of motor vehicle traffic and air lead levels, the physical and chemical characteristics of lead aerosols, the importance of dietary lead intake, lead body burdens, blood and urine levels of lead as indices of lead intake and in relation to occupational plumbism, methods of analysis of biological samples of lead, the effects of lead on health, occupational lead poisoning, biochemical consequences of lead absorption, the concept of a lead threshold, and lead air quality standards. The conventional stages of plumbism, in order of increasing disability, are: manifestations of gastrointestinal disorders, damage to the neuromuscular system, and encephalopathy. No proven cases of lead poisoning are recorded for airborne lead exposures of the type experienced in urban areas which are attributed principally to automotive exhaust emissions, though the absence of frank clinical symptomatology may not be the proper criterion by which to judge environmental exposure to lead.

43997 **APTIC NO. 66785**

Um, Chang-Hyun

STUDY OF THE SECULAR TREND IN ASBESTOS BODIES IN LUNGS IN LONDON 1936-66. *Brit. Med. J. (London), vol. 2:248-251, May 1, 1971. 9 refs.*

Thick sections (30 micron unstained) cut from blocks of lung tissue from 100 consecutive necropsies from the years 1936, 1946, 1956, and 1966 were obtained from a hospital in London and examined microscopically for asbestos bodies. The incidence of asbestos bodies rose progressively 0, 3, 14, and 20%, respectively, for the time periods examined and was not explained by the increasing age of death for the later years or by the likely effects of changes in the areas of London where the deaths occurred. There was no similar increase in the incidence of other bodies in the lungs which might be mistaken for asbestos bodies. The rising incidence fit reasonably well with a model based on the hypothesis that the risk of inhaling asbestos increases in relation to the cumulative total of asbestos imported into the country from 1910 onwards. The rising incidence did not fit a model in which the risk depends simply on the current level of asbestos imports. (Author abstract modified)

43998 **APTIC NO. 67320**

Van Ganse, W., J. Oleffe, W. Van Hove, and G. Groetenbriel

CONTRIBUTION TO THE STUDY OF THE IMMUNOLOGICAL ASPECTS OF CHRONIC BERYLLIOSIS. *(Contribution a l etude des aspects immunologiques de la berylliose chronique). Lille Med. (France), 16(5):680-686, 1971. 15 refs. Translated from French. Translation Consultants, Ltd., Arlington, Va., 16p.*

The immunological aspects of chronic berylliosis were studied on a 45-year-old patient. A patch test with beryllium fluoride was positive upon inspection beginning from a concentration of 0.1% and negative in the case of 15 control subjects. A histological examination revealed the presence of lymphocyte infiltrates. A normal lymphocyte transformation (79%) with phytohemagglutin as well as a discrete one occurred with (small) doses of beryllium (9%) and beryllium fluoride (12%); higher doses did not cause lymphocyte transformation; the lymphocytes of a control subject experienced stimulation with any of the doses used. A dosage of immunoglobulins gave normal readings with the exception of a slight increase of the IgG Intradermal tests of Mantoux, Kveim, as well as tests of house dust were all negative. Tissue reactions induced by beryllium seem to be caused by an immunological reaction of the delayed hypersensitivity type owing to the action of sensitized lymphocytes.

1970

43999 **APTIC NO. 67302**

Frank, Robert

CLEAN AND DIRTY LUNGS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 323-338, 1972. 24 refs. (Aug. 3-15.)*

The effects of atmospheric pollutants on the respiratory system are discussed. The portion of the respiratory system that is affected is determined by the concentration, physical and chemical properties of the pollutant, the pattern of breathing, and the presence or absence of pulmonary disease. Adverse health effects may be caused by synergistic combinations of pollutants, such as sulfur dioxide and saline aerosols, although evidence for this is meager. Pollutants may impair one or another component of the clearance mechanism of the lung while increasing the susceptibility to, and seriousness of, airborne infections. There is evidence that oxidizing pollutants may interact with either the structural proteins of the lung or their surrounding matrix.

44000 **APTIC NO. 67313**

Fukuyama, Yuzo and Kentaro Kubota

STUDIES ON THE ETIOLOGY OF ITAI-ITAI DISEASE. *Igaku to Seibutsugaku, 80(3):131-135, March 10, 1970. Translated from Japanese. Leo Kanner Associates, Redwood City, Calif., 7p., Jan. 1973.*

A study of the itai-itai disease in Japan is described. Urine samples were collected from inhabitants of the area of high itai-itai disease incidence, from patients, and from dwellers of a control area, and a gel filtration was performed for each urine sample. A measurement based on the Folin-Lowry method was taken. The G25 albumin ratio was then calculated and used as an indication of the degree of kidney disorder caused by chronic cadmium poisoning. The history of the inhabitants and patients was also studied. Cases of kidney disorder caused by chronic cadmium poisoning were found in both sexes. The itai-itai disease could be caused by intake of cadmium in great quantities, especially during pregnancy. The drinking water in the area was highly contaminated with cadmium.

44001 **APTIC NO. 67333**

Grupper, C., M. Hincky, and Y. Edelson

BERYLLIC GRANULOMA. *(Granulome beryllique). Bull. Soc. Fr. Dermatol. Syphiligr., vol. 77:156-157, 1970. 3 refs. Translated from French. Translation Consultants, Ltd., Arlington, Va., 6p.*

Beryllium poisoning can cause three types of cutaneous lesions: contact dermatitis from exposure to beryllium fluorosulfate in fumes or other forms; ulcers from beryllium sulfate in a wound; and subcutaneous granulomas occurring in numbers during a pulmonary berylliosis or separately after an injury by a fluorescent lamp. A case study of a woman suffering from beryllic granulomas occurring after an injury by a fluorescent lamp is reviewed.

44002 **APTIC NO. 67031**

Mitchell, Roger S.

EFFECTS OF AIR POLLUTION ON HUMAN LUNGS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 505-512. (Aug. 5-15.)*

The sources and effects of air pollution on human lungs are described. Pollution disasters were recorded in Meuse Valley (Belgium), Donora, Pa., London, and New York as a result of sulfur oxides, particulates, and carbon monoxide pollution. While no air pollution disease has been identified, air pollution can be acutely lethal and is probably one of the causes of chronic bronchitis, emphysema, and lung cancer. The five major sources of air pollution are transportation (60% of the total), industry (17%), electricity (14%), heat (6%), and incineration (3%). In Los Angeles the automobile is responsible for 95% of air pollution. Diesel engines produce black smoke, more odors, and more nitrogen oxides than gasoline engines, but the gasoline engine is a more important source of CO. The danger level for CO is concentrations greater than 30%, although headache and slight cerebral dysfunction begin to occur at concentrations above 5%. Carbon monoxide increases the deposition of fats in blood vessel walls which may explain the increased incidence of coronary arteriosclerosis and fatal myocardial infarction in smokers. Epidemiologic studies show that when smoking histories, sex, and age are held constant, urban dwellers die somewhat younger than rural dwellers.

44003 **APTIC NO. 67308**

Mitchell, Roger S.

EFFECTS OF AIR POLLUTION ON HUMAN LUNGS. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 505-512, 1972. (Aug. 3-15.)*

The sources of air pollutants and their effects on human lungs are reviewed. The five major pollutants and their sources are carbon monoxide, sulfur oxides, hydrocarbons, nitrogen oxides, and particulates from automobiles, industry, electricity, heat, and incineration. Automobiles are responsible for 60% of the total. The gasoline powered vehicles are a more important source of CO while the diesel powered engines produce more NOx and blacker smoke. The danger level for CO is more than 30% and headache and slight cerebral dysfunction begin at more than 5%. No air pollution disease has been identified, but air pollution can be lethal acutely at times and probably is one of the causes of chronic bronchitis, emphysema, and lung cancer.

1969

44004 **APTIC NO. 67266**

Battigelli, Mario C.

PARTICULATES: AIR QUALITY CRITERIA BASED ON HEALTH EFFECTS. *North Carolina Univ., Chapel Hill, School of Medicine, American Petroleum Inst., Air Quality Monograph 69-2, 18p., 1969. 30 refs.*

Acute and chronic effects of particulates on humans are reviewed in relation to establishing air quality criteria based on health effects. Inhaled particulates, in high concentrations, cause a measurable physiological effect on the airways in terms of increased airway resistance, minor changes in compliance, and disturbance in ventilation uniformity, though such effects are observed more clearly at concentrations much higher than those measured in air pollution situations. Preliminary observations on patients exposed to realistic pollution levels, however, suggest a deteriorating effect; and the chronic effect of inhalation of particulates at urban concentration levels appears related to the deposition of black pigment in the lungs. The deposition is not associated convincingly with any morphological pulmonary or cardiovascular disorder. Highly soluble gases, such as formaldehyde and sulfur dioxide, which are usually promptly absorbed in the upper airways, are delivered further down in the respiratory system when they are absorbed on particulates of respirable size (less than 2-3 microns). The condensation of gas on particulates followed by a rapid release of the gas molecules to the tissue fluids on impact is postulated but not verified experimentally. It is also not possible to accept, at the present time, the synergistic increase in airway resistance as a characteristic response in man to the inhalation of sulfur dioxide in an aerosol mixture. Experimentation directed to the elucidation of particle-gas interaction is needed. (Author summary modified)

44005 **APTIC NO. 67269**

Battigelli, Mario C.

FACTS AND OPINIONS ON THE ROLE OF SULFUR DIOXIDE IN CAUSING INJURY. *North Carolina Univ., Chapel Hill, School of Medicine, American Petroleum Inst., Air Quality Monograph 69-10, 23p., 1969. 81 refs.*

The alleged human health effects of sulfur dioxide are examined in terms of increased mortality and morbidity associated with air pollution episodes. Volunteers exposed to controlled SO2 levels at concentrations comparable to those encountered in air pollution disasters (1-2 ppm) appear to experience an inconsistent and limited increase in airway resistance which hardly can be elaborated into a mechanism of injury and death. Asthmatic effects from experimental SO2 exposure are documented but at levels well above those of urban range. Furthermore, the features of asthma do not coincide with or characterize the clinical pattern of air pollution symptomatology. Inhibition of or interference with the mucus escalator, effects on the pulmonary circulation, bronchitis-type changes, and effects on pulmonary surfactants are recorded, but only at concentrations far higher than those found in ambient air. The role of SO2 in causing health damage, at levels found in ambient air, is highly questionable.

44006 **APTIC NO. 67319**

Kurysheva, N. G.

THE INCLUSION OF TAGGED AMINO ACIDS LYSINE 14C AND GLYCINE 14C IN SOLUBLE AND INSOLUBLE LUNG PROTEINS DURING EXPERIMENTAL BERYLLIOSIS. *(Vklyucheniye mechenykh aminokislot lizine-C14 i glitsina-C14 v rastvorimyye i nerastvorimyye belki legkogo pri eksperimental nom berillioze). Gigiena i Truda Prof. Zabolevaniya, vol. 13:51-52, July 1969. Translated from Russian. Translation Consultants, Ltd., Arlington, Va., 5p.*

Certain aspects of the metabolism of lung proteins were studied during experimental berylliosis caused in 200 g male rats by one endotracheal injection of 5 mg of beryllium oxide in 1 ml of 0.85% solution of sodium chloride. Lysine carbon(14) and glycine carbon(14) were injected subcutaneously on the basis of 500 pulses/g of weight 2.5 hr prior to the animals being put to death. The radioactivity of the soluble and insoluble lung proteins was then determined. The inclusion of lysine 14C in the insoluble lung proteins increased within 24 hr and rose during the succeeding periods of the research. The radioactivity of the insoluble lung proteins fell somewhat a month after injection of the beryllium oxide, and by the end of 2 mo, the magnitude of lysine inclusion in the insoluble proteins approached the control level. Investigations made using glycine 14C inclusion for the period of maximum changes, 2 weeks, also showed an increase in the inclusion of the tag of 80% compared to the norm. Increase in the inclusion of 14C in the insoluble proteins was commensurate with the increase in the dry weight of the lungs. Also, increase in inclusion of lysine in the soluble proteins occurred on the days following injection of beryllium oxide, but the increase was considerably smaller than the increase in the inclusion of lysine in the insoluble proteins. This was followed by an increase in the tag inclusion process as a result of the development of the illness. The increase was 33% in 14 days compared to the control. The increase in the inclusion of tagged amino acids in the insoluble lung proteins of test rats apparently was attributable to the increase in the synthesis of these proteins.

1968

44007 **APTIC NO. 67334**

Samosh, L. V., M. A. Pilinskaya, L. V. Martson, and A. I. Kurinnyy

THE VALUE OF STUDYING THE MUTAGENIC AND EMBRYONIC PROPERTIES OF PESTICIDES FOR TOXICOLOGICAL-HYGIENIC ASSESSMENT. *(Znacheniye issledovaniy mutagennykh i embriotoksicheskikh svoystv pestitsidov dlya ikh toksikologogigiyenicheskoy otsenki). Proc All-Union Sci. Conf. Hyg. Toxicol. Pestic., 4th, USSR, 1968, p. 748-756. 22 refs. (June 11-14.) Translated from Russian. Scientific Translation Service, Santa Barbara, Calif., 11p.*

The effects of pesticides on embryos and genetics are reviewed. Systematic study of the mutagenicity of industrial poisons, products of chemical synthesis and widely used pesticides, is not being conducted. In individual studies, cytogenetic effects of some pesticides have been determined. Although most studies covered the mutation changes in somatic cells, there is every basis for considering that they also occur with the same frequency in sex cells. More research is needed on human cells, particularly on blood leukocyte cultures. The mutagenic and embryotoxic properties of dithiocarbamic acid derivatives (the fungicides cineb, cirame, and maneb) were determined in studies of fruit flies and leukocyte cultures of human blood. The Drosophila were not a completely suitable model to expose the genetic danger of pesticides for man. The effects of the fungicides cineb, cirame, and maneb on the embryonic development and generative function of random bred white rats were also studied. The cytogenetic activity of the fungicides were revealed in experiments on the bone marrow of mice and a leukocyte culture of human peripheral blood. Genetic studies must be conducted on biological subjects far removed from man, in particular, insects. The potential and possible actual genetic danger of pesticides can be assessed on the basis of comparing data from tests on human cells in vitro and on the entire organism of laboratory animals.

1967

44008 **APTIC NO. 67332**

Fazzari, C. and C. Catini

SOME MORPHOLOGICAL ASPECTS OF THE RENAL EPITHELIUM DURING ZINC CHLORIDE TREATMENT. *(Alcuni aspetti morfologici dell epitelio renale in corso di trattamento con cloruro di zinco). Sperimentale, no. 117:299-314, 1967. 19 refs. Translated from Italian. Translation Consultants, Ltd., Arlington, Va., 20p.*

The structure of rat kidney after treatment with zinc chloride was studied. Ten rats were injected with a 1 ml solution of ZnCl2 every other day for 20 days, 10 animals were injected with a 2 ml solution every other day for 20 days, and four rats were kept as controls. Two kinds of changes were found, one concerning the nucleus and the other concerning the cytoplasm. The nuclei appeared very frequently larger than normal and showed an irregular shape. They contained an amount of Feulgen-negative and basophil material, irregularly scattered, and two types of inclusions: acidophil inclusions, surrounded by little Feulgen-positive granules, and achromatic inclusions, which could be detected because of the different refraction index. The cytoplasm sometimes presented a considerably rarefied structure and sometimes appeared very dense with acidophil granules. The stroma did not show any appreciable modification after treatment. The changes observed in the epithelial cells were qualitatively independent from the dose of ZnCl2 administered to the animals. Two or 3 weeks after the end of the treatment, the structure of the rat kidney appeared normal.

1966

44009 **APTIC NO. 67331**

Horstowa, Halina, Maciej Sikorski, and Henryk Tyborski

CHRONIC CADMIUM POISONING IN THE CLINICAL AND RADIOLOGICAL PICTURE. *(Przewlekle zatrucie kadmem w obrazie klinicznym i radiologicznym). Med. Pracy (Warsaw), 7(1), 1966. 29 refs. Translated from Polish. Leo Kanner Associates, Redwood City, Calif., 28p., Jan. 1973.*

Examinations were made of 26 workers employed in an alkaline battery factory at sites where they were exposed to cadmium compounds in dust. In all the persons who were a part of a group of 80 workers, chronic cadmium poisoning was determined on the basis of clinical symptoms. The results of the various tests and poisoning symptoms are described. The basic symptoms during chronic cadmium poisoning are anemia, abscesses in the mucous membrane in the nostrils, a cadmium edge, proteinuria, dysproteinemia, increased cadmium in the blood and urine, weakness, feelings of ill health, fatigue, insomnia, shortness of breath, muscular pains, and nose bleeding. The disease can be divided into three stages: exposure without clinical symptoms, chronic cadmium poisoning (which is further divided into the early and later poisoning symptom stages), and a period of metatoxic changes.

44010 **APTIC NO. 67314**

Hoveid, Per

FOLLOW-UP STUDY OF THE CHLORINE GAS ACCIDENT OF JANUARY 26, 1940 IN MJONDALEN. *(Klorgassulykken in Mjondalen 26. januar 1940; en etterundersokelse). Nord. Hyg. Tidskr. (Copenhagen), 37(3-4):59- 66, 1966. 8 refs. Translated from Norwegian: Leo Kanner Associates, Redwood City, Calif., 10p., Jan. 1973.*

When a railroad car containing about 14 tons of chlorine exploded on a siding near the Mjondalen cellulose plant, two persons were killed and 85 persons were hospitalized. Symptoms included cough, dyspnea, expectoration, physical alterations in lungs, fever, vomiting, conjunctivitis, befuddled sensorium, pulmonary edema, hemoglobin over 110, and eye and respiratory irritation. The most severe symptoms developed rapidly in persons who had undergone physical exertion as well as poisoning. The gas concentration that each person had been exposed to was determined, and concentrations were related to symptoms. Thresholds determined were: slight irritation, 1 ppm chlorine; lowest detectable concentration, 3.5 ppm; greatest concentration that can be breathed for 1 hr without serious consequences, 4 ppm; least concentration causing a sore throat, 15 ppm; least concentration causing a cough, 30 ppm; concentration dangerous after 0.5-1.0- hour exposure, 40-60 ppm; and concentration deadly after a few breaths, 1000 ppm. Almost all of the hospitalized casualties were exposed to at least 30 ppm. A follow-up questionnaire was sent to the 82 hospitalized casualties after discharge. Women seemed to suffer less long-term effect than men. Only 29 of the 82 persons reported difficulties after the gassing. The most frequent complaint was dyspnea. Persons having serious cases experienced more difficulties after discharge from the hospital than milder cases.

1962

44011 **APTIC NO. 66839**

Wagner, J. C.

EXPERIMENTAL PRODUCTION OF MESOTHELIAL TUMOURS OF THE PLEURA BY IMPLANTATION OF DUSTS IN LABORATORY ANIMALS. *Nature (London), 196(4850):180-181, Oct. 13, 1962. 5 refs.*

In view of the possible association between the development of mesotheliomas of the pleura and exposure to asbestos dust in people living in the Cape asbestos fields, a preliminary experiment was undertaken to see if it was possible to produce meotheliomas in animals by injecting various forms of asbestos into the pleural cavities. Young rats, mice, and guinea pigs were used. Tumors which appeared to be arising from the mesothelial cells of the pleura were produced by inoculating certain dusts into the pleural cavities of rats. A tumor was obtained by exposing an animal to an asbestos dust cloud. The neoplasms were produced by silica and chrysotile asbestos as well as crocidolite fiber.

EFFECTS-PLANTS AND LIVESTOCK

1974

44012 **APTIC NO. 66987**

Auersch, Otto

SCIENTIFIC RESULTS FROM THE FIELD EXPERIMENT STATION TESTING THE EFFECTS OF IMMISSION IN THE COMBINE VEB CHEMICAL PLANTS BUNA, SCHKOPAU. *(Wissenschaftliche Ergebnisse aus* *der Feldversuchsstation fuer Immissionskunde im Kombinat VEB Chemische Werke Buna, Schkopau). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 79-91. 3 refs.*

By analyzing plant damage it is possible to determine the territorial expansion of phytotoxic emissions. In contrast to forests, short-lived field cultures or agriculture suffer, as a rule, only from acute damages. The effects on later yield have to be worked out for each case in order to decide on compensations for injuries caused. These injuries are always caused by a definite emitter within each local immission site.

44013 **APTIC NO. 66801**

Chang, Chong W. and Howard E. Heggestad

EFFECT OF OZONE ON PHOTOSYSTEM II IN SPINACIA OLERACEA CHLOROPLASTS. *Phytochemistry, 13(6):871-873, 1974. 9 refs.*

Spinach plants were treated with 0.35 ppm of ozone, and the photochemical activity of the photosystem II was determined after separation from the isolated chloroplasts using digitonin. Ozone impaired the activity of the system and reduced the amount of beta-carotene in the chloroplasts. (Author abstract)

44014 **APTIC NO. 66983**

Daessler, Hans-Guenther

THE TOXICITY OF FLUORINE COMPOUNDS. FLUORINE INJURIES IN AGRICULTURE AND FORESTRY. *(Zur Toxizitaet von Fluorverbindungen. Fluorschaeden in der Land- und Forstwirtschaft). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 52-57.*

Sources for fluorine containing emissions are hydrofluoric acid plants, aluminum plants, the glass industry, producers of phosphate containing fertilizers, brick kilns, and the ceramic industry. Little attention has been paid in the past to fluorine containing coal whose fluorine content ranges from 2 to 3 mg/kg referred to dry coal. The maximum allowable immission concentration for fluorine in the German Democratic Republic is 10 micrograms/cu m air. A review of the effects of fluorine immissions on agriculture, horticulture, and forestry is given. The fluorine content in plants from immission free areas was determined to range from 0.2 to 2.0 mg/100 g dry substance. Agriculture and forestry strives to reduce fluorine injuries by selecting fluorine resistant species. For this, extensive fumigation experiments in the field and in potted cultures are needed. Exposure to low hydrogen fluoride concentrations and simultaneous measurement of carbon dioxide metabolism supply information on yield reductions and on any possible lowering of the nutrient content. Main emphasis must be placed, however, on reducing the emissions which can be achieved by absorption systems operating with water, diluted caustic soda, and sodium carbonate solution.

44015 **APTIC NO. 67013**

Doorn, Wouter G. van

INFLUENCE OF ENVIRONMENTAL FACTORS ON PLANT BIOELECTRICAL POTENTIAL DIFFERENCE. LITERATURE REVIEW. *Preprint, Iowa State Univ. of Science and Technology, Ames, Dept. of Horticulture, 33p., 1974. 45 refs.*

A literature review on the influence of environmental factors, particularly air pollutants, on plant bioelectrical potential (BEP) is presented along with some conclusions on the physiological cause of the recorded potential differences and the possibility of using BEP measurement as an indicator for pollutant influences on plants under field conditions. Studies are cited concerning the effects of salt concentration and composition, hormone IAA, temperature, and light on BEP differences in the root environment of plants; BEP differences in the shoot environment resulting from such influences as water condition, temperature, atmospheric gas composition, presence or absence of light, light intensity and spectral composition, electrode placement, presence or absence of chlorophyll in the plant, and the presence of such air pollutants as 2,4-dichlorophenoxy acetic acid, sulfur dioxide, chloroform, ether, and ozone are also investigated. Bioelectrical potential differences are detectable between all outer parts of the intact plant and are possibly due to local differences in ion concentration of the extracellular medium and conductivity of the tissue between two electrodes. Some metabolic process directly linked to photosynthesis must cause the photoresponses since, among other factors, chlorophyll is needed for the formation of the BEP change. Placing two plant groups in transparent field chambers, one filtered and the other unfiltered with respect to air pollutants, is suggested as a promising method for further studying the effects of air pollutants on BEP.

44016 **APTIC NO. 66630**

Fries, N., K. Flodin, J. Bjurman, and J. Parsby

INFLUENCE OF VOLATILE ALDEHYDES AND TERPENOIDS ON THE TRANSPIRATION OF WHEAT. *Naturwissenschaften (Berlin), 61(10):452-453, 1974. 5 refs.*

The influence of six aliphatic aldehydes (trans-2-hexenal, penta-, hexa, hepta, octa, and nonanal) and three terpenoids (alpha-pinene, beta-pinene and delta3-carene) on the transpiration rate of young wheat plants was studied. An apparatus was constructed for the continuous measurement of the transpiration of a young wheat plant enclosed in a cuvette through which air is passed at constant flow rate, constant temperature, and constant relative humidity. Each experiment was started by keeping the plant in darkness for 30 min and then exposing it to high light intensity (12500 lux) for 60 min, or until the transpiration curve stabilized. When the stomata where about half open, the volatile component was introduced in the air stream. All components reduced the rate of transpiration, the aldehydes to a level lower than under dark conditions, the terpenoids to a more moderate extent. Less exact measurements were possible with lower concentrations of volatiles, but the aldehydes clearly produced a decrease in transpiration rate even at 0.00001 mol.

44017 **APTIC NO. 67191**

Fujiwara, Takashi, Takeshi Umezawa, and Haruhiko Ishikawa

EFFECTS OF MIXED AIR POLLUTANTS ON VEGETATION. I. SULFUR DIOXIDE, NITROGEN DIOXIDE AND OZONE INTERACTION TO INJURE IN PEA AND SPINACH. *(Taiki osenshitsu fukugo no shokubutsu ni oyobosu eikyo ni kansuru kenkyu). Text in Japanese. Agricultural Electric Power Research Inst., 13p., 1974 (?). 16 refs.*

The mixed effects of sulfur dioxide, nitrogen dioxide, and ozone on foliar injury to pea and spinach plants were investigated under artificial conditions at gas concentrations below 0.2 ppm. The greatest synergistic action with respect to foliar injury of pea plants occurred with SO2 and O3 exposures: SO2 and NO2 showed slight synergism at an SO2 concentration of 0.2 ppm, while NO2 and O3 combinations resulted in no synergistic effects. An equation for calculating the percentage of foliar injury to peas from SO2 and O3 was derived in terms of the concentrations of the two gases. Sulfur dioxide and O3 showed light synergism with respect to spinach injury at 0.1 and 0.2 ppm concentrations of SO2 and 0.2 ppm O3, though no injury was observed at 0.1 ppm O3 under the same SO2 concentrations.

44018 **APTIC NO. 66984**

Lux, Herbert

IMMISSION INJURIES IN FORESTS OF THE DISTRICT COTTBUS. *(Immissionsschaeden in der Forstwirtschaft* *des Bezirkes Cottbus). Text in German. In: Technik und Umweltschutz LufteWasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 58-62. 3 refs.*

Immissions from the power plants Luebbenau and Vetschau led only recently to injuries of pines in the state-owned forests of Cottbus and Luebben. Very recently pine injuries from combustion of natural gas in flares have been discovered in an area spanning 300 hectares. On the leeward side of the combine Black Pump sulfur dioxide and sulfur trioxide injuries of pines were discovered. In an area of about 15 hectares only about 20% of the trees seem to be unaffected; 740 more hectares are affected but to a lesser degree. In the vicinity of the chemical plants Schwarzheide, Lauchhammer, and Ruhland SO2 and chlorine emissions have injured the neighboring coniferous and deciduous trees. The dying rate of trees was determined in the older tree populations of the state-owned forests of Luebben, Cottbus, Hoyerswerda, and Weisswasser. In the period from 1964 to 1970 11.4% of the total number of pines died in the observation area around the mine and power generation combine Black Pump and the chemical plant Schwarzheide; in Luebbenau-Vetschau the percentage was 9.6; and in the areas more remote from emission sources the percentage ranged around 3 or 3.4.

44019 **APTIC NO. 66918**

Yermakov, Y. G.

BIOINDICATOR METHODS FOR THE DETERMINATION OF AIR POLLUTION. *(Bioindikatornyye metody opredeleniya zagryazneniya vozdukha). Text in Russian. Gigiena i Sanit., no. 8:68-70, 1974. 1 ref.*

The use of lichens as bioindicators of air pollution, especially due to sulfur dioxide is described through examples. A standard scale of 10 grades was developed in England for the characterization of SO2-generated air pollution from the presence or absence of definite lichen species. The distribution and levels of SO2 around an industrial plant with intense SO2 emission in Canada were determined from the population and taxonomic composition of lichens on balsam poplar. The resulting map of the spread of the SO2 pollution was in good agreement with that obtained on the basis of more time-consuming chemical analyses.

1973

44020 **APTIC NO. 67352**

Baddeley, M. S., B. W. Ferry, and E. J. Finegan

SULPHUR DIOXIDE AND RESPIRATION IN LICHENS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 14, p. 299-313. 14 refs.*

Methods of studying the effects of sulfur dioxide on lichen physiology, particularly respiration, in the laboratory are discussed. Emphasis is placed on the problems involved in relating conditions in laboratory experiments to field situations and on the need to maintain strict control of conditions in laboratory experiments. Sulfur dioxide concentrations were tested in the 1-112 ppm range in solution. With some lichens, effects of respiration were observed with concentrations at low as 3.5 ppm applied for 15 min, while in other instances there was still some appreciable respiration at 112 ppm after 18 hr exposure. Factors influencing sensitivity in laboratory and field situations include: the physiological state of lichen material at the time of exposure to SO2, the effect of lichen substrates and thalli on SO2, particularly with regard to oxidation to sulfate; influence of thallus morphology and wettability on SO2 uptake; and the possible importance of capacity to recover from sublethal doses of SO2 in the field. (Author conclusions modified)

44021 **APTIC NO. 67355**

Baddeley, M. S. and B. W. Ferry

SUMMARY: SCOPE AND DIRECTION OF FUTURE WORK. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 17, p. 368-377. 6 refs.*

Current and suggested research on the relationship between air pollution and lichens are discussed. There is limited knowledge on the effects of ozone, nitrogen oxides, organic effluents, and agricultural chemicals on lichens or the additive or synergistic effects of pollutants. The use of lichens as pollution indicators might be applied in urban planning and the siting and distribution of industrial sites through mapping techniques. Difficulties encountered in the application of mapping to identification and standardization of sites with respect to other environmental factors tend to limit its application. The development of transplant techniques offers potential for the simulation of field conditions in a laboratory. Further work is needed on the mechanisms of accumulation of pollutants in the lichen thallus, and the intracellular sites at which these substances are deposited

44022 **APTIC NO. 67345**

Coppins, B. J.

THE DROUGHT HYPOTHESIS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 7, p. 124-142. 43 refs.*

The drought hypothesis which claims that atmospheric dryness rather than pollution is responsible for the lack of urban lichens is discussed. Dr. Jan Rydzak rejects claims of the sensitivity of lichens to the levels of sulfur dioxide normally found in towns and around isolated industrial plants. Rydzak considered the zonation patterns seen in urban lichen floras to be due to adverse microclimatic conditions, particularly the lowering of humidity, increased temperature, and an increased frequency of drying/wetting regimes. Arguments are presented for the hypothesis, but many cannot be substantiated by field and laboratory investigations. Sulfur dioxide in the air can better explain the changes which have occurred in the lichen vegetation in both urban areas and the rural areas surrounding them. City induced drought may have some effect on those species able to withstand the current SO2 levels in cities, but this is not likely to be important in suburban and surrounding rural areas. Some data tentatively indicate some correlation between relative humidity and SO2 effects under experimental conditions. These effects would be limited to the most hygrophilous species able to survive the prevailing SO2 levels. (Author conclusions modified)

44023 **APTIC NO. 67350**

Farrar, J. F.

LICHEN PHYSIOLOGY: PROGRESS AND PITFALLS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 12, p. 238-282. 122 refs.*

The metabolism of sulfur and its compounds by lichens is discussed. Dispite the proposed sensitivity of lichens to atmospheric sulfur dioxide, very little is known about the metabolism of S compounds. Without more detailed knowledge of the way in which lichens use S and sequester it in the thallus under normal conditions, it is difficult to interpret experiments in which sulfur oxides are applied and their effects monitored by changes in some physiological parameter not obviously connected with S metabolism per se. The accumulation of S from city air by live thalli of Usnea filipendula is six times greater than that by dead thalli; both the dead thalli and cotton wool also accumulate appreciable amounts of S. Most S absorption under these conditions was metabolic, but some was non-metabolic. A review of photosynthesis and general metabolism is given. The effects of environmental variables including water, temperature, light, pH and nutrients, and seasonal variation are also discussed.

44024 **APTIC NO. 66642**

Fujiwara, T., T. Umezawa, and H. Ishikawa

EFFECTS OF MIXED AIR POLLUTANTS ON VEGETATION, PART I. SULFUR DIOXIDE, NITROGEN DIOXIDE AND OZONE TO INJURE PEAS AND SPINACH. *(Taiki osen fukugo no shokubutsu ni oyobosu eikyo ni kansuru kenkyu, 1: SO2, NO2, O3 fukugo no eikyo). Text in Japanese. Noden Inst. (Japan), Central Institute of Electric Power, Rept. 72007, 12p., Aug. 1973. 16 refs.*

Effects of sulfur dioxide, nitrogen dioxide, and ozone, singly and combined on foliar injury to potted garden peas and spinach were studied in a controlled-condition room under artificial illumination. After exposure for 4 hr and kept until the next day, the degree of the injury was the highest with a mixture of three pollutants, followed by that of O3 and SO2, then by that of O3 and NO2, and then by O3 only. No injury was observed in the case of SO2 or NO2 only. The respective concentrations of the three gases were 0.10-0.11, 0.20-0.21, and 0.10-0.11 ppm in the above order.

44025 **APTIC NO. 67347**

Gilbert, O. L.

THE EFFECT OF AIRBORNE FLUORIDES. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 5, p. 176-191. 20 refs.*

The effects of airborne fluorides on lichens is discussed. The toxicity of fluorides to lichens was established by field studies showing that the lichen flora in the vicinity of isolated point sources is severely impoverished, field transplant experiments, and fumigation experiments. Exposure to 13 ppb for 36, 72, and 108 hr causes chlorotic spots and curled margins; 65 ppb for 12 hr produces similar symptoms. Accumulation occurred during fumigation whether visible damage was produced or not. Fluoride damage is reported from Britain, Canada, France, Norway, and the United States. These studies all find F2 toxic to lichens, but there is no agreement on the order of sensitivity. The degree of shelter can have a major effect on the distribution of damage. There is evidence that species can better tolerate the pollution when growing in eutrophicated conditions. Lichens are useful indicators of the spread of F2 pollution from aluminum smelters.

44026 **APTIC NO. 66735**

Grill, Dieter

A STUDY ON SO2-FUMIGATED NEEDLES OF SPRUCE BY SCANNING ELECTRON MICROSCOPY. *(Elektronenmikroskopische Untersuchungen an SO2-belasteten Fichtennadeln). Text in German. Phytopathol. Z., no. 78:75-80, 1973. 18 refs.*

Spruce needles from a sulfur dioxide-damaged area were studied by means of scanning electron microscopy. Sulfur dioxide, even when dissolved in water as sulfurous acid, never caused corrosion of the surface of the needles, while the wax structures on the needle surfaces were affected. Young needles showed an agglutination of their wax tubes, which is indicative of premature aging due to SO2. Older needles showed, however, a more aggregated and grained wax structure. Smoke-damaged needles were unable to produce any more wax. The effect of SO2 was most manifest in the oldest needles.

44027 **APTIC NO. 67018**

Grill, D. and H. Esterbauer

CYSTEINE AND GLUTATHIONE IN INTACT AND SO2-DAMAGED SPRUCE NEEDLES. *(Cystein und Glutathion in gesunden und SO2-geschaedigten Fichtennadeln). Text in German. Eur. J. Forest Pathol., 3(2):65-71, 1973. 27 refs.*

Healthy and sulfur dioxide damaged spruce needles were analyzed for water soluble sulfhydryl groups. Total SH content was mainly due to glutathione with some cysteine. Increased cysteine content was only in old needles. Total content of SH groups fluctuates seasonally in the same way in both healthy and damaged needles. Needles damaged from SO2 always contain more SH groups than healthy needles except immediately after flushing.

44028 **APTIC NO. 67341**

Hawksworth, D. L.

MAPPING STUDIES. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 3, p. 38-76. 214 refs.*

Techniques for producing cartographic represention of fixed data on lichen flora and vegetation in polluted areas are reviewed. Where sufficient data from volumetric recording gauges are available, scales can be constructed and calibrated which provide a rapid and accurate estimate of mean annual or mean winter sulfur dioxide levels based solely on the lichen vegetation. The scales are of particular value in areas with mean SO2 levels in their range less than 30-170 micrograms/cu m, and are most sensitive in the range less than 30-70 micrograms/cu m. Epiphytic lichens are the most suitable indicators. Scales and zone maps are based upon a number of carefully selected species which are readily recognizable. (Author conclusions modified)

44029 **APTIC NO. 67354**

Hawksworth, D. L., F. Rose, and B. J. Coppins

CHANGES IN THE LICHEN FLORA OF ENGLAND AND WALES ATTRIBUTABLE TO POLLUTION OF THE AIR BY SULPHUR DIOXIDE. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 16, p. 330-367. 113 refs.*

Changes in the lichen flora of England and Wales which are attributable to air pollution are described. Increases in mean levels of sulfur dioxide in the air have had an extremely deleterious effect on the lichen vegetation of England and Wales. Local differences in meteorological factors which occur in urban areas can be ignored, but any general climatic trends must be considered. Meteorological changes which occurred between 1800 and 1970 produced improved conditions for lichen growth, but the lichen vegetation in those areas of England which have mean winter SO2 levels below 30 micrograms/cu m remained almost unchanged. Since 1958 there has been a decline in emissions of SO2 from commercial, domestic, and industrial sources, but a correspondingly large increase in the emissions from power stations.

44030 **APTIC NO. 67328**

Horng, Arbeit J. and S. F. Yang

PEROXIDASE-CATALYZED OXIDATION OF INDOLE-3-ACETALDEHYDE TO 4-HYDROXYQUINOLINE IN THE PRESENCE OF BISULFITE ION: ELIMINATION OF PYRROLE RING C2 AS FORMIC ACID. *Biochim. Biophys. Acta, vol. 321:456-460, 1973. 15 refs.*

Isotope labeling techniques and spectrophotometry were used to investigate the metabolism of the horseradish peroxidase-catalyzed oxidation of indole-3-acetaldehyde to 4-hydroxyquinoline in the presence of bisulfite ion. Oxidation of an indole-3-acetaldehyde-sodium bisulfite adduct to 4-hydroxyquinoline appeared to occur with loss of a carbon at the ring-2 position, with the lost carbon being recovered as formic acid. The oxidative conversion was 20% as estimated by its absorbance at 316 nm. A free radical mechanism was postulated in which the pyrrole ring was first opened by oxidation, followed by the elimination of C2 and ring closure.

44031 **APTIC NO. 66743**

Hutchinson, T. C. and L. M. Whitby

A STUDY OF AIRBORNE CONTAMINATION OF VEGETATION AND SOILS BY HEAVY METALS FROM THE SUDBURY COPPER-NICKEL SMELTERS, CANADA. *Toronto Univ., Toronto (Canada), Dept. of Botany and the Inst. of Environmental Sciences and Engineering, Rept. EL-3, 17p., Nov. 1973. 15 refs.*

Soil, vegetation, and rainfall samples were collected for heavy metal analysis by atomic absorption spectrometry in an investigation of airborne contamination from copper-nickel smelters in the Sudbury basin region of Canada. Both Cu and Ni showed declining concentrations in soil and vegetation with increasing distance from the smelters. Rainfall was more acidic the closer its proximity to the smelters, with large quantities of Cu, Ni, and iron being present in a pattern of distribution which again pointed to the smelters as a continuing source of metal pollution. Growth of the radicles of tomato and lettuce seedlings in water extracts of soils collected at various distances from a smelter was severely inhibited at distances up to 8 km from the smelter.

44032 **APTIC NO. 67346**

James, P. W.

THE EFFECT OF AIR POLLUTANTS OTHER THAN HYDROGEN FLUORIDE AND SULPHUR DIOXIDE ON LICHENS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 8, p. 143-175. 118 refs.*

The effects of heavy metals, smokes, and farming chemicals on lichens are reviewed. Heavy metal fallout, especially of copper, cadmium, iron, lead, manganese, nickel, and zinc, result from smoke particulates from the partial combustion of coal and oil and from smelting processes and vehicle exhausts. The maximum tolerance levels for individual metals are not known, but heavy metal pollution can be lethal. Mechanical effects of the deposition of particulate smoke emissions as well as airborne dust from quarry workings and road usages are known. Heavy dust fallout appears to be lethal to most species. There is evidence of air pollution damage caused by farming techniques using artificial fertilizers, fungicidal sprays, and selective weed killers. Other dangerous pollutants are radionuclides and ionizing radiation.

44033 **APTIC NO. 67344**

Laundon, J. R.

URBAN LICHEN STUDIES. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 6, p. 109-123. 41 refs.*

A review of urban lichen studies is presented. They are chiefly concerned with the impoverished lichen flora of towns and cities and the reasons for this poverty. Air pollution is generally blamed for this scarcity. Pollution was reported as early as 1273, but it did not become widespread until the middle of the 19th century. There is no recorded marked improvement in the lichen flora of any urban area to date because of the high levels of sulfur dioxide. The history of urban studies is categorized into early investigations, zonation, aridity, scales, modifying factors, and other investigations. (Author summary modified)

44034 **APTIC NO. 67353**

Margot, J.

EXPERIMENTAL STUDY OF THE EFFECTS OF SULPHUR DIOXIDE ON THE SOREDIA OF HYPOGYMNIA PHYSODES. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 15, p. 314-329. 2 refs.*

The effects of sulfur dioxide on the soredia of Hypogymnia physodes were investigated. The lichens were injected with gaseous SO2 in concentrations of 0.05, 0.1, and 1.0 ppm and sprayed with concentrations of 0.15, 0.75, and 1.5 meq/100 ml of ammonium sulfate in solution. In both cases the pollutant affected the lichen and its soredia according to the concentration of the pollutant, the frequency and number of injections, and the length of the conditioning time. A maximum effect for a given treatment is reached at some point, and the pollutant is more harmful in conditions of high relative humidity. This method is applicable to different species and in mapping studies of air pollution. (Author conclusions modified)

44035 **APTIC NO. 67343**

Morgan-Huws, D. I. and F. N. Haynes

DISTRIBUTION OF SOME EPIPHYTIC LICHENS AROUND AN OIL REFINERY AT FAWLEY, HAMPSHIRE. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 5, p. 89-108. 10 refs.*

The distribution of some epiphytic lichens around an oil refinery at Fawley, Hampshire (England) was investigated in 1966. There was a direct relationship between the annual average sulfur dioxide levels and the zonation of the lichen vegetation of oak trunks. There was no evidence of any effect of relative humidity. The different levels of tolerance to SO2 for the eleven species investigated are similar to those found in a more general survey of the lichens of oak trunks in the southwest of Hampshire, and in other parts of England and Wales. The influence of SO2 around urban areas where it is typically accompanied by much higher smoke levels is evident implying that smoke may not be a factor contributing to the limitation of the lichen vegetation in such areas. (Author conclusions modified)

44036 **APTIC NO. 67348**

Nash, T. H., III

THE EFFECT OF AIR POLLUTION ON OTHER PLANTS, PARTICULARLY VASCULAR PLANTS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 10, p. 192-223. 201 refs.*

The effect of air pollution on vascular plants, mosses, and fungi is reviewed. Specific pollutants include sulfur dioxide, fluorides, ozone, nitrogen oxide, peroxyacetyl nitrate (PAN), and particulates. A mean annual local concentration of SO2 above 0.01-0.08 ppm causes extensive phytotoxic effects in many species. Symptoms of fluoride poisoning vary tremendously between plant groups. Background variations of F2 in plants generally range between 0.5 and 25.0 ppm by weight. The range of 25-105 ppm is the critical range for sensitive species. The most sensitive species are injured by O3 fumigations between 5 and 12 pphm for 2-4 hr, while resistant species tolerate concentrations as high as 100 pphm. Plants respond physiologically to subacute dosages of NOx although higher concentration of NOx than SO2 are required to produce necrotic markings. Damage from PAN can occur at concentrations below 0.1 ppm. The chloroplasts are particularly sensitive. Damage can also occur from ethylene, chlorine, hydrogen chloride, ammonia, and heavy metal particulates as arsenic, copper, lead, zinc, cadmium, iron, nickel, and cobalt. Mosses are approximately as sensitive to air pollution as lichens and are affected by SO2, O3, F2, and some heavy metals. Fungi are also sensitive to SO2 and O3.

44037 **APTIC NO. 67349**

Pearson, L. C.

AIR POLLUTION AND LICHEN PHYSIOLOGY: PROGRESS AND PROBLEMS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 11, p. 225-237. 38 refs.*

The effects of sulfur dioxide pollution on lichens were investigated. The rate of respiration in desert lichens increased by exposure to SO2 fumes. The amino acid composition of the proteins of L. melanophthalma were measured using paper chromatography. The R subscript F values of both cysteine and cystine decreased in direct proportion to the degree of pollution. The correlation between air pollution, as determined by the distance from the source, and change in the amino acids was high and statistically significant. Sulfur dioxide and carbon monoxide cause similar morphological symptoms in lichens. There were no changes in the amino acids as a result of CO fumigation.

44038 **APTIC NO. 67351**

Richardson, D. H. S. and K. J. Puckett

SULPHUR DIOXIDE AND PHOTOSYNTHESIS IN LICHENS. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 13, p. 283-298. 25 refs.*

The effects of sulfur dioxide on photosynthesis in lichens are reviewed. There may be a temporary and partial inhibition of photosynthesis in the presence of low concentrations of SO2. Several chronic fumigations may interfere with the flow of nutrients, such as carbohydrates, between the symbionts resulting in the breakdown of the symbiosis. The disappearance of lichens from industrial areas with low prevailing SO2 concentrations may be explained by effects on the physiology of the symbiosis. The action of SO2 on photosynthesis depends on the intensity of fumigation and ranges from a temporary inhibition of photosynthesis to a permanent reduction associated with chlorophyll breakdown. Sulfur dioxide is less toxic when buffered at high pH. The pH determines the proportion of the different ionic species (sulfurous acid, bisulfite, sulfite) in aqueous solutions. The increased toxicity of SO2 to lichens observed at low pH (3.2-4.4) is associated in part with the destruction of chlorophyll by an irreversible oxidation process.

44039 **APTIC NO. 67342**

Rose, F.

DETAILED MAPPING IN SOUTH-EAST ENGLAND. *In: Air Pollution and Lichens. B. W. Ferry, M. S. Baddeley, and D. L. Hawksworth (eds.), Toronto, Toronto Univ. Press, 1973, Chapt. 4, p. 77-88. 4 refs.*

Detailed mapping of the distribution, ecology, and phytosociology of epiphytic lichens in south-east England was made. Trees in densely built-up parts of the London conurbation only rarely had any epiphytic lichens except for Lecanora conizaeoides. The distribution patterns of many epiphytic lichens correlate very well with mean winter sulfur dioxide levels. Attempts to demonstrate correlations with other factors such as rainfall were not successful. Species distribution maps establish the relative tolerance of particular species, but they are less satisfactory than zone maps which consider many species and their frequency for the practical assessment of mean SO2 levels on the basis of the lichen vegetation.

44040 **APTIC NO. 66892**

Shinohara, Toshikiyo, Yoshitada Yamamoto, Hiroshi Kitano, and Michio Fukuda

EFFECTS OF TEMPERATURE ON OZONE INJURY TO TOBACCO. *Nippon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), 42(4): 418-421, Dec. 1973. 13 refs.*

The effects of temperature on ozone injury to three varieties of tobacco were studied in exposure chambers at O3 levels between 20-35 pphm and for exposure periods of 1.5-2.0 hrs. Plants grown at 23 C were more sensitive to O3 than those grown at 13 C, with night temperatures producing greater effects on the O3 sensitivity than daytime temperatures. Temperatures during fumigation were negatively correlated to the severity of O3 injury for temperatures between 13 and 32 C. The occurrence and development of symptoms, as measured by the ratio of freshly- flecked leaves to total number of injured leaves, was accelerated by high temperatures after fumigation; although the amount of flecks and the number of leaves flecked were greater for plants subjected to lower temperatures subsequent to fumigation. No increase in leaf flecking occurred when 48 hrs or more elapsed following fumigation.

44041 **APTIC NO. 66893**

Shinohara, Toshikiyo, Yoshitada Yamamoto, Hiroshi Kitano, and Michio Fukuda

THE RELATION BETWEEN OZONE TREATMENT AND THE INJURY IN TOBACCO. *Nippon Sakumotsu Gakkai Kiji (Proc. Crop Sci. Soc. Japan), 42(4):412-417, Dec. 1973. 21 refs.*

The effects of light and ozone exposure on three varieties of tobacco were investigated in fumigation chambers for exposure periods of 1-4 hr and O3 concentrations between 10 and 40 pphm. Light showed no effect on the plants response to O3 exposure. Visible damage in the form of leaf flecks was observed at 30 pphm for one variety and 20 pphm O3 for another variety of tobacco. Doses in shorter exposures were more injurious than equal or higher doses given over longer periods, indicating that O3 damage was not related to a simple dose-response concept. Detached leaves were suitable for O3 damage studies when fumigation was conducted for shorter periods such as 1-2 hrs.

1972

44042 **APTIC NO. 67026**

Feliciano, Alberto

SURVEY AND ASSESSMENT OF AIR POLLUTION DAMAGE TO VEGETATION IN NEW JERSEY 1971. *Rutgers - The State Univ., New Brunswick, N. J., Dept. of Plant Biology, Environmental Protection Agency Contract 68-02-0078, Rept. EPA-R5-72-010, 53p., Oct. 1972. 11 refs.*

NTIS: PB 214 160

A survey of injury resulting from air pollution episodes and assessment of their resultant effect on crop production in 1971 was conducted in New Jersey. Three hundred fifteen reported air pollution incidences were investigated and documented during the period of the survey which was concentrated in the central and southern counties of the state. Plant injury was observed in 17 counties, but economic loss or crop damage was observed in only 16 of these counties. Over one fourth ($337,265) of the total crop losses ($1,185,800) for New Jersey were recorded in Cumberland County. The photochemical pollutants were responsible for 80% of the plant injury recorded, with ozone contributing about 60% and peroxyacetyl nitrate 20% of the total. The other pollutants involved and their percentages of plant injury are hydrogen chloride mist and chlorine gas 6%, ethylene 3%, fluoride 2%, sulfur dioxide 2%, ammonia 2%, particulates 2%, and oil, petroleum, and an unidentified pollutant 3%. Only 29 out of 70 plant species observed exhibited injury. Vegetables accounted for 51% of the total crop loss. Damage to lettuce accounted for over one third of the vegetable loss and 12% of the total estimated crops. (Author abstract modified)

44043 **APTIC NO. 66731**

Grosse-Bauckmann, E. and V. Troll

ON THE TECHNIQUE OF POT TRIALS: HOW SHOULD THE PARALLEL POTS OF THE EXPERIMENTAL UNITS BE ARRANGED? *(Zur Technik des Gefaessversuches: Wie sollen die Parallelgefasse der Versuchsglieder aufgestellt werden)? Text in German. Landwirtsch. Forsch., 25(1):48-52, 1972. 5 refs.*

The optimum arrangement of pots in greenhouse experiments for compensation of microclimatic differences was studied in a model experiment using potted Sinapis alba. The arrangement of the parallel pots can influence the experimental results especially when pots with tall and short plants are placed next to each other. The random arrangement of pots was the most suitable for the growth conditions not only from the statistical but also from the technical and experimental point of view. Mechanical installations which continually change the positions of the pots increase the accuracy of the experiments, but are no real alternative to a random arrangement.

44044 **APTIC NO. 66714**

Houten, J. G. ten

INFLUENCE OF AIR POLLUTION ON PLANTS. *(Invloed van luchtverontreiniging op planten). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/ Brussels, Intermediair, 1972, p. 47-55. 8 refs.*

The effects of air pollutants, such as hydrofluoric acid, sulfur dioxide, nitrogen dioxide, peroxyacetyl nitrate, and ozone on plants are surveyed. While there are substantial species-specific differences in the resistance of plants to air pollutants, plants are generally more sensitive to them than animals and humans, except for carbon monoxide and hydrogen sulfide. Thus, it is possible to select certain plant species as indicator plants for pollution monitoring. Necrosis of the leaf edges by HF, and interneural necrosis due to SO2 were observed. Once retained, SO2 is readily detoxicated in the leaves by metabolism to sulfates. Peroxyacetyl nitrate and ozone cause zonal necrosis of the leaves probably through the inhibition of the enolase enzyme. Changes in the taxonomic composition of the wild flora in polluted areas were observed.

44045 **APTIC NO. 66798**

Ionescu, A., G. Serbanescu, and G. Pal

ELEMENTS OF THE SYMPTOMATOLOGY OF FLUOR POLLUTED PLANTS. *Rev. Roum. Biol. Ser. Bot., 17(2):135-144, 1972. 27 refs.*

The toxic effects of fluorine compounds on plants was studied near aluminum and phosphatic fertilizer factories. The general condition of the vegetation in the polluted area, necrosis and foliar and floral discolorations, and sterility in some plant species are discussed. Physiological analyses concerning functional stomata, cellular sap concentration, and biometry were used to explain the fluorine intoxication process. They also constituted an indicative test of the degree of pollution. Symptoms of injury can be used to determine thresholds and tolerance levels for fluoride injuries. (Author abstract modified)

44046 **APTIC NO. 66715**

Tesink, J.

AIR POLLUTION AND ITS EFFECTS ON DOMESTIC ANIMALS. *(Verontreiniging van de buitenlucht en gevolgen voor landbouwhuisdieren). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 56-75. 29 refs.*

The effects of various air pollutants on domestic animals are reviewed. Fluorine compounds, inhaled or mostly ingested in contaminated grass, cause osteoid tissue formation, exostoses, mottled tooth enamel, and anorexia in cattle in chronic exposure. Fluorine content of the milk is negligible, and elimination takes place primarily in the urine. Sulfur dioxide irritates the mucosa, intensifies mucus production, and inactivates the cilia. Nitrogen oxides, apart from being irritating, are noxious for domestic animals primarily via the formation of high nitrate and nitrite levels in grass. Chronic exposure to lead, especially in grass growing along highways, leads to anemia, and to the degeneration of brain and nerve cells. Profuse diarrhea and reduced milk production are caused by ingestion of molybdenum-contaminated grass in cattle. The effects of carbon monoxide are due to the reduction of the oxygen supply by hemoglobin.

1970

44047 **APTIC NO. 67304**

Jacobson, Jay S.

THE PLANT-MEDIATED CONSEQUENCES OF AIR POLLUTION. *Colorado Univ., Boulder, Air Water Pollut., Proc. Summer Workshop, Boulder, Colo., 1970, p. 417-424, 1972. 14 refs. (Aug. 3-15.)*

The effects of air pollution on plants and vegetation are discussed. The most serious threats to vegetation in North America are from photochemical oxidants (ozone and peroxyacetyl nitrate), fluorides, and sulfur dioxide. Injury to plants by other pollutants as ethylene, nitrogen dioxide, chlorine, hydrochloric acid, and particulate matter play a more limited role. Tobacco plants are widely used as a biological indicator of O3 because leaves exhibit flecking when exposed to O3. Parts per billion concentrations of fluoride in air can cause severe damage to sensitive vegetation. Large areas of land are still contaminated by sulfur oxides resulting from pollution from smelters in existence 70 yr ago.

EFFECTS-MATERIALS

1973

44048 **APTIC NO. 66645**

Winslow, F. H., W. Matreyek, and A. M. Trozzolo

THE ACTION OF AIR POLLUTANTS OF POLYMERS. *(Azione degli agenti atmosferici sui polimeri). Text in Italian. Nuova Chim. (Rome), no. 7:25-31, July 1973. 25 refs.*

The effect of physical factors, such as humidity, ultraviolet radiation, oxygen, and ozone on polymers are surveyed. Discoloration, brittleness, and photodegradation may be caused by atmospheric factors in polymers. Aromatic polymers and those containing many hydrogen atoms bound to secondary and tertiary carbon atoms are especially sensitive to atmospheric agents. The resistance of polymers decreases in the order of polytetrafluoroethylene, polymethyl metacrylate, polyethylene terephthalate, polycarbonate, polyethylene, polyvinyl chloride, polystyrene, and nylon. Pretreatment with ozone increases the rate of photooxidation by about 10%.

EFFECTS-ECONOMIC

1974

44049 **APTIC NO. 66904**

Hirst, Eric

POLLUTION-CONTROL ENERGY. *Mech. Eng., 96(9):28-35, Sept. 1974. 39 refs.*

A preliminary study of energy costs to clean up and maintain the quality of the environment in the areas of urban passenger traffic, waste water treatment, solid waste management, air pollution control, and waste heat dissipation is discussed. The specific environmental quality control strategies analyzed included a 10% shift from urban auto traffic to mass transit; adoption of automobile pollution control devices to meet clean air standards; redesign of automobiles to improve fuel economy; secondary level sewage treatment for all waste water; disposal of all solid waste by landfilling; production of electricity from incineration of 10% of the total solid waste; production of 1/3 of the steel, aluminum, and paper from recycled scrap; control of sulfur and particulate emissions from stationary sources; and use of cooling towers at half of all power plants. The energy increases and savings in trillion Btu for each of these scenarios are, respectively, 320 savings, 1100 increase, 1100 savings, 290 increase, 75 increase, 290 savings, 440 savings, 840 increase, and 160 savings. The total increase of 2465 trillion Btu would be 3.66% of total energy use; the total savings of 2150 trillion Btu would be -3.19% of total energy use. In spite of the assumptions and limitations used in developing the estimates, several interesting and useful conclusions can be drawn. The quantities of energy required to achieve various environmental quality goals are relatively small. Thus, present energy growth rates cannot be attributed to operation of environmental protection systems. Energy needs for environmental protection can be more than offset through various conservation measures such as recycling, generation of electricity with solid waste, mass transit increases, and improved automobile fuel economy. Such energy conservation methods would reduce pollution, conserve scarce energy resources, and save money for consumers. The conclusions in regard to primary energy closely correspond to those for electric energy. (Author conclusions modified)

44050 **APTIC NO. 66865**

Kates, Richard M.

ECONOMICS OF POLLUTION CONTROL. *Preprint, 4p., 1974 (?).*

The economic advantages of pollution control in areas of personnel, Federal taxes, and warranties are discussed. Workers tend to seek employment in pollution free areas because of health hazards from pollutants. It is less expensive to install pollution control equipment than it is to shut down a plant even though prices for equipment are increasing at a rate of more than 1% per mo. Many states exempt pollution control equipment from personal property tax. In Federal taxation there is a special speeded up 5 yr amortization of pollution control equipment if that equipment has been certified by a state or Federal agency, and if an election is made in the month in which the equipment was completed or acquired or in the taxable year succeeding the taxable year in which such facility is completed or acquired. Pollution control equipment can lead to efficiencies that cause quick cost recovery and then lead to profits.

44051 **APTIC NO. 66693**

Rentz, Otto

COMPARATIVE CONSIDERATION OF VARIOUS COLLECTION METHODS WITH REGARD TO ECONOMY. *(Vergleichende Betrachtungen verschiedener Abscheideverfahren unter Beruecksichtigung der Wirtschaftlichkeit. Text in German. Staub, Reinhaltung Luft, 34(9):332-337, Sept. 1974. 17 refs.*

The cost comparison calculation for various dust collectors (cloth filter, electrostatic precipitator) installed in the production facilities for ferrosilicon alloy production yielded investment costs for the dust collecting devices amounting to more than 20% of the investments for the production process itself. The annual operating costs increase the specific production costs for high silicon alloys by $33 to $133/ton. After the numerical example, the validity of the cost comparison calculation in general terms is discussed and critically evaluated. The comparative consideration of dust collectors requires that the individual technical alternatives have already been optimized. A number of unsolved optimization problems are discussed, which, although they are limited to tubular bag filters of cloth, are also valid for electrostatic precipitators and venturi scrubbers.

44052 **APTIC NO. 66810**

Schuler, Richard E.

AIR QUALITY IMPROVEMENT AND LONG RUN URBAN FORM. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 3, p. 173-198, June 1974. 10 refs.*

Possible multiplicative benefits of decreasing emissions from large stationary sources in the central business district of an urban area are mathematically assessed. Households will not only benefit from reduced emissions at their current residences but in the long run will relocate toward the central business district, resulting in a further reduction of aggregate pollution due to lower transport emissions. Relocation of households toward the central business district may, however, partially offset the second-order benefits unless household emissions are regulated at the same time that large stationary sources are restricted. The effect of substitution of mass transit for private auto commuting depends on whether average velocity declines more than the commuting cost per mile since portal to portal time would in all probability increase. Relocation of households to the central business district would result in larger property tax collections which would help to pay for additional services required for the increased population density.

44053 **APTIC NO. 67261**

Willeke, Rainer and E. A. Marburger

EEC REPORT. STUDY OF ENVIRONMENTAL POLLUTION AND ENVIRONMENTAL INJURIES BY TRAFFIC IN URBAN AREAS - NOISE AND EXHAUST GASES. II.3. DETERMINATION OF THE TOTAL ECONOMIC COSTS OF THE POLLUTION BY AUTOMOBILE EXHAUSTS AS WELL AS OF THEIR MARGINAL COSTS. *(EG-Enguete. Untersuchung der Umweltbelaestigung und Umweltschaedigung durch den Strassenverkehr in Stadtgebieten - Laerm und Abgase. II.3. Ermittlung der gesamtwirtschaftlichen Kosten der Belastung durch Autoabgase sowie deren Grenzkostenanteil). Text in German. Cologne Univ. (West Germany), Inst. fuer Verkehrswissenschaft, and VDI (Verein Deutscher Ingenieure), Dussseldorf (West Germany), Kommission Laermminderung and Kommission Reinhaltung der Luft, 143p., 1974. 184 refs.*

For quantification of the total economic costs of environmental pollution by automobile exhausts, the approach of indirect cost estimation has been taken. For this, knowledge of the relationship between emissions and immissions is of importance. Therefore, the extent to which automobile emissions have to be reduced so that the immission limits recommended in part II.2 of the report are not exceeded was determined. Measurements in Cologne have shown that under normal conditions significant excesses of the medical immission limits are to be expected only for carbon monoxide. It was therefore considered permissible to use the CO immissions as a suitable parameter characterizing the air pollution by automobile exhausts. The costs of environmental pollution can then be derived from the efforts for reduction of the CO immissions. With the aid of an equation which was derived as a regression function at the immission measurements in Cologne, the required reduction quotas were determined. The results postulate a 40% reduction of the CO emissions. For determination of the costs arising through measures for reduction, individual automobile manufacturers were investigated. It was demanded that technical measures are considered which at the same time reduce the hydrocarbon emission by 40% and the oxides of nitrogen emission by 30%. Since the required measures can only be installed on new automobiles the costs were extrapolated to the anticipated number of new cars licensed within the decade 1973 - 1982 in the Federal Republic of Germany. For the required 40% reduction of the CO emission, a total amount of $4.7 billion would be necessary. A 30 to 40% reduction of the traffic density during the rush-hour periods, would nearly eliminate all excesses of the half-hourly maximum allowable immission concentrations. It would not help reduce the CO emission below the long-term maximum allowable immission limit.

44054 APTIC NO. 67262

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Laermmingderung and Kommission Reinhaltung der Luft

EEC REPORT. STUDY OF ENVIRONMENTAL POLLUTION AND ENVIRONMENTAL INJURIES BY TRAFFIC IN URBAN AREAS - NOISE AND EXHAUST GASES - SUMMARIZING OVERVIEW. *(EG-Enquete Untersuchung der Umweltbelaestigung und Umweltschaedigung durch den Strassenverkehr in Stadtgebieten - Laerm und Abgase, Zusammenfassender Ueberblick). Text in German. 24p., March 1974.*

The report is part of an extensive study to be carried out by member nations of the European Community with the exception of Luxemburg on the theoretical and practical problems resulting from the use of streets in urban areas. The purpose of the study is the development of a suitable calculation method for the additional or marginal costs arising through the reduction of the noise and exhaust gas pollution by traffic in urban areas to a desired level. The following aspects were studied separately for the two sectors of noise and air pollution: present extent of environmental pollution by traffic, psychological and physiological effects, and social and marginal costs. An outline of procedure and results described in the three parts dealing with exhaust gases is given.

1973

44055 APTIC NO. 66786

Bowden, B. J.

OIL AND THE U.K. *Mine Quarry, vol. 2:42-45, Feb. 1973.*

Oil reserves in the United Kingdom are discussed in relation to estimated costs for their development and current and projected increases in oil consumption resulting from changes in the relative economics of specific fuels and changes in environmental requirements involving air pollution control. So-called unconventional sources of oil such as tar sands, shales, and coal, though costly when compared to present production costs in the Middle East, may become economical in the future. The North Sea also appears to be a promising source of oil, as well as gas, though capital requirements for North Sea oil are expected to be at least ten times as high as those for the Middle East.

44056 APTIC NO. 66749

Davies, David S., Ricardo A. Jimenez, and Paul A. Lemke

ECONOMICS OF LIMESTONE NEUTRALIZATION OF ABATEMENT-DERIVED CONCENTRATED SULFURIC ACID. *Preprint, American Inst. of Chemical Engineers, New York, 24p., 1973. (Presented at the American Institute of Chemical Engineers, Annual Meeting, 66th, Philadelphia, Pa., Nov. 11-15, 1973.)*

An economic analysis is presented for limestone neutralization of abatement-derived concentrated sulfuric acid for eventual disposal of the acid waste. Both wet-gypsum and dry disposal processes are viable from a technical viewpoint, with the choice of neutralization process being based on the particular circumstances existing at each plant location. The cost of limestone, as well as the limestone grind required for efficient reaction, are sensitive cost parameters which require evaluation for each application. Final costs are influenced by limestone transportation, acid transportation, plant site and disposal area land availability, waste product transportation to the disposal site, and utilities availability. Other than direct process- related capital and operating costs, the decision rests on the disposal method of by-product calcium sulfate, management of the disposed by-product from the environmental and cost viewpoint, process reliability and ease of operation, limestone source and reserves, and water restrictions. (Author conclusions modified)

44057 APTIC NO. 66745

Dewees, D. N.

ECONOMICS OF POLLUTION. *Toronto Univ., Toronto (Canada), Dept. of Political Economy and the Inst. of Environmental Sciences and Engineering, Rept. EF-15, 16p., Dec 1973. 14 refs.*

The economics of pollution are considered in terms of action necessary to include natural resources such as air and water in the economic system. Although it appears impossible to suggest how much environmental quality should be provided, programs which differentiate among cities and regions of the country based on population density, density of pollution sources, and the ability of the environment to carry off wastes appear superior to uniform national programs. Any programs will be better to the extent that it creates incentives for technological change in pollution control devices since this is frequently a very important factor in determining long-run abatement costs. Programs involving effluent charges rather than uniform standards lead to abatement where it is least expensive, promote technical progress, and minimize feasibility hearings on complex abatement technology. The Canadian automobile pollution policy is discussed in relation to pollution economics and standards being adopted in America.

44058 APTIC NO. 67016

Parker, M. J.

ENERGY PROSPECTS IN THE U.K. U.K. ENERGY: THE FUTURE CONTRIBUTION OF COAL. *Mine Quarry, vol. 2:41-42, Feb. 1973.*

Trends in energy supply and consumption in the United Kingdom are reviewed in relation to the world energy situation and in terms of the future contribution of coal to energy requirements. Total energy consumption from coal, natural gas, oil, and nuclear or hydropower in the United Kingdom is 333 million tons coal equivalent for 1970 as compared to 269 million tons coal equivalent for 1960. Strategic and economic reasons appear to necessitate a policy based on the primacy of indigenous supplies. Despite natural gas and nuclear power, the United Kingdom will still need some 300 million tons coal equivalent from oil and coal in the 1980 s, with the most likely sources for making up the balance being North Sea oil and home-produced coal.

1972

44059 APTIC NO. 66772

Babcock, Lyndon R., Jr. and Niren L. Nagda

EMISSION CONTROL STRATEGIES: COSTS AND BENEFITS. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 325-344. 9 refs. (April 20-21.)*

The nationwide cost of meeting 1976 air quality standards and the effectiveness of the program are assessed by relating costs of emission control to air quality improvement and to economic damage reductions. A pollution index derived from Environmental Protection Agency ambient standards is used to assess pollution levels and cost control. Annual damages attributable to air pollution were assumed equal to $16 billion for the 1967-1968 period. Thirty eight emission categories were studied, and cost/benefit ratios were determined as the measure of cost effectiveness for each category for which cost information was available. Implementation of the EPA strategy should reduce air pollution damages by 1976 to 56% of 1967 levels. The overall cost effectiveness of EPA strategy is estimated at 0.50. Three categories together account for 49% of the nation s air pollution damage: steam electric power plants, gasoline motor vehicles, and industrial boilers. Pollution index methods are used to probe cost-benefit relationships and other implications of federal air quality policies. Carbon monoxide, nitrogen dioxide, hydrocarbons, oxidant, sulfur oxides, and particulate matter air pollutants are considered in a nationwide overview. (Author abstract modified)

44060 **APTIC NO. 66720**

Klok, H. J.

THE ECONOMICS OF ENVIRONMENTAL PROTECTION. *(De economie van de milieuvernietiging). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 321-333. 5 refs.*

Economics of environmental deterioration and environmental protection are discussed with special regard to the western world. Stepped-up production and consumption has resulted in an ever-increasing scarcity of intact environment in general, and of natural resources in particular, as well as in increased environmental degradation whose control requires substantial expenditures. The costs of environmental protection act as an economic factor controlling growth, making goods more expensive under the conditions of pollution-generating production. Environmental protection requires adequate international cooperation to be efficient. The current economic growth and development does not necessarily end up in the self-destruction of mankind.

44061 **APTIC NO. 67015**

Scherer, Charles R.

AN ANALYSIS OF THE JUSTIFICATION FOR REVERSING ELECTRIC RATE STRUCTURES IN VIEW OF ENVIRONMENTAL QUALITY CONSIDERATIONS. *Preprint, Inst. of Management Science, Providence, R. I., 31p., 1972. 81 refs. (Presented at the Institute of Management Science International Meeting, 19th, Houston, Tex., April 4-8, 1972.)*

The standard theoretical basis for decreasing block rate structures in electric power pricing is reviewed. Emphasis was placed on a necessary assumption, in particular that technical externalities associated with power production are negligible. Recognizing that these externalities may not be negligible, an extension of the theory is suggested for determining whether or not decreasing rates are still appropriate. An application is given using ex ante empirical evidence. Whether or not decreasing block rates is appropriate depends more on the type of fuel burned in new steam electric plants than on the level of emission control on these plants. When new plants are coal fired, costs increase as system size increases over the same range of emissions. Although emission standards clearly influence system costs, the type of fuel used in new thermal electric plants is more important in determining system average cost slope than emission control standards. (Author abstract modified)

44062 **APTIC NO. 67394**

Winsche, W. E., K. C. Hoffman, and F. J. Salzano

ECONOMICS OF HYDROGEN FUEL FOR TRANSPORTATION AND OTHER RESIDENTIAL APPLICATIONS. *American Chemical Society, Washington, D. C.; American Inst. of Aeronautics and Astronautics, New York; American Society of Mechanical Engineers, New York; Inst. of Electrical and Electronic Engineers, New York; American Inst. of Chemical Engineers, New York; American Nuclear Society, Hinsdale, Ill.; and Society of Automotive Engineers, New York, Proc. Intersociety Energy Conversion Eng. Conf., 7th, San Diego, Calif., 1972, p. 1366-1374. 20 refs. (Sept. 25-29, Paper 729215.)*

Hydrogen is a promising synthetic fuel which can be derived from water using a wide range of energy sources including nuclear and solar energy. In order to examine the potential role of H2 in the nation s energy economy, the economics of H2 delivered to the domestic consumer, the current state of the technology, and the research and development required to implement H2 production and delivery systems are discussed. It is increasingly apparent that research and development will eventually allow application of H2 fuel in all types of domestic energy systems including the automobile, space heating, cooking, refrigeration, and electrical generation. A comparison is made between several representative energy delivery systems using H2 and conventional energy systems using electricity and gasoline. The results show that synthetic H2 fuel can be competitive with current energy technologies within the limits of uncertainty regarding cost estimates of the operations within the energy systems. Quantitative information is given on the environmental advantages of H2 which make it an attractive and flexible secondary source of energy. A considerable amount of engineering research and development is required before implementation of an H2 energy economy. The current state of the art and some areas of technology to be advanced before implementation of H2 as a universal fuel are discussed. (Author abstract modified)

STANDARDS AND CRITERIA

1974

44063 **APTIC NO. 66709**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. PRIMARY COPPER, ZINC, AND LEAD SMELTERS. *Federal Register, 39(201): 37040-37049, Oct. 16, 1974.*

Standards of performance for new and modified primary copper, lead, and zinc smelters are proposed. The standards apply to all process gas streams which were identified as major sources of particulate matter and sulfur dioxide and for which control technology was demonstrated. Emission standards for particulate matter were set at 50 mg/dscm (0.022 gr/dscf). Gases discharged into the atmosphere cannot contain SO2 in excess of 0.065% by volume. Visible emissions cannot be discharged into the atmosphere if they exhibit 20% or greater opacity for 2 min in any 1 hr. Measurement systems are specified for smoke, SO2, and opacity of gases. Procedures and methods for testing and monitoring are specified.

44064 **APTIC NO. 66858**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. MODIFICATION, NOTIFICATION, AND RECONSTRUCTION. *Federal Register, 39(200):36946-36950, Oct. 15, 1974.*

Revisions and additions to the Clean Air Act as amended are proposed to clarify the definitions of modification, notification, and reconstruction. The provisions apply to all standards of performance for new and modified sources. The proposed amendments clarify that the construction of an affected facility at a stationary source that does not constitute a modification of the stationary source does not cause the entire stationary source to become subject to the standards of performance.

44065 **APTIC NO. 66859**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. COAL PREPARATION PLANTS. *Federal Register, 39(207):37922-37924, Oct. 24, 1974.*

Standards of performance for new stationary sources are proposed for coal preparation plants. Coal preparation plants are major sources of particulate matter emissions which can have an adverse effect on health. Future coal preparation plants must comply with the proposed opacity standards. Gases discharged from any thermal dryer cannot contain particulate matter in excess of 0.070 g/dscm or exhibit 30% opacity or greater. Gas discharged into the atmosphere from any pneumatic coal cleaning equipment cannot contain particulate matter in excess of 0.040 g/dscm or exhibit 20% opacity or greater. Procedures and methods for testing and monitoring are included.

44066 **APTIC NO. 66860**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. PROPOSED RULE FOR PRIMARY ALUMINUM PLANTS. *Federal Register, 39(206): 37730-37741, Oct. 23, 1974.*

Standards of performance for new and modified primary aluminum plants are proposed. The proposed standards do not differentiate between primary and secondary emissions and encourage owners of new plants to obtain maximum containment of the gaseous emissions at the cell. Two types of control devices will be used: wet gas scrubbers in series with an electrostatic precipitator or dry fabric filters which use alumina as an adsorbent. Gases discharged into the atmosphere from the potroom cannot exhibit 10% opacity or greater and those from the anode bake plant cannot exceed 20% opacity. Gases cannot be discharged which contain total fluorides in excess of 1 kg/metric ton of aluminum produced. Procedures and methods for testing and monitoring are specified.

44067 **APTIC NO. 66862**

Quarles, John

ASBESTOS AND MERCURY. PROPOSED AMENDMENTS TO NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS. *Federal Register, 39(208):38064-38073, Oct. 25, 1974.*

Proposed amendments to the National Emission Standards for Hazardous Air Pollutants are announced for asbestos and mercury. Additional major sources of asbestos from manufacturing and fabricating industries are identified. Amendments to the demolition provisions of the asbestos standard are proposed and include a definition for friable asbestos materials. Proposed provisions for the disposal of asbestos waste require that there be no visible emissions to the outside air during any stage of the disposal process. An amendment to the Hg standard is proposed to limit Hg emissions from the incineration and drying of waste water treatment plant sludges to a maximum of 3200 g/day. This insures that sources would not cause the ambient Hg concentration to exceed 1 microgram/cu m averaged over a 30 day period. The environmental and economic impact of these proposed standards are discussed.

44068 **APTIC NO. 66916**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. FIVE CATEGORIES OF SOURCES IN THE PHOSPHATE FERTILIZER INDUSTRY. *Federal Register, 39(205):37602-37607, Oct. 22, 1974.*

Standards of performance for five categories of sources within the phosphate fertilizer industry are proposed. The sources are wet process phosphoric acid plants, super-phosphoric acid plants, diammonium phosphate plants, triple superphosphate plants, and granular triple superphosphate storage facilities. The standards require installation of high efficiency gas scrubbers. Construction of both of the more common processes for manufacture of superphosphoric acid is permitted even though one also emits pollutants other than fluorides (sulfur dioxide and hydrocarbons). Visible emission standards are proposed for diammonium phosphate plants, triple superphosphate plants, and granular triple superphosphate storage facilities. The effluent gas streams from these processes include particulate matter (both fluoride and non-fluoride), as well as gaseous fluoride. The possible odor environmental impact was determined to be negligible.

44069 **APTIC NO. 67000**

Quarles, John

STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES. OPACITY PROVISIONS. *Federal Register, 39(219):39872-39875, Nov. 12, 1974.*

A response is given to a remand by the Court of Appeals for the District of Columbia which directed the Environmental Protection Agency to reconsider the use of the opacity standards of performance for Portland cement plants which are part of the new stationary source performance standards. Provisions promulgated include a revision to the section on compliance with standards and maintenance requirements, a revision to the opacity standard for Portland cement, and revisions to the reference method nine. The bases for the revisions are discussed.

44070 **APTIC NO. 67187**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NATIONAL AMBIENT AIR QUALITY STANDARDS--NEVADA. *Federal Register, 39(207):37784, Oct. 24, 1974.*

Areas in Nevada which have the potential for violating specified air quality standards are described. The Las Vegas Standard Metropolitan Statistical Area is proposed as an Air Quality Maintenance Area for particulate matter and photochemical oxidants, but not for carbon monoxide as was previously proposed. The Reno Standard Metropolitan Statistical Area is proposed as an Air Quality Maintenance Area for particulate matter.

44071 **APTIC NO. 66644**

FEDERAL EMISSION PROTECTION LAW. LIMIT VALUES FOR EMISSIONS FROM STACKS. *(Bundes-Immissionsschutzgesetz. Emissions- Grenzwerte aus Kaminen). Text in German. Sanit. Heizungstech., 39(10):644-647, 1974.*

The first regulation for execution of the Federal Emission Protection Act went into effect on Oct. 1, 1974. It primarily contains limit values concerning emissions from stacks. It pertains to firing systems operated with solid or liquid fuels. For example, the carbon dioxide content of oil plants with atomizing burners which have been installed prior to issuance of the regulation may not be lower than 7% for new heating systems mechanically charged this limit value is 10%. The waste gas from boilers fired with solid fuel may contain a maximum of 300 mg dust, soot, and tar. The smoke plume from all firing systems must have a greytone lighter than the greytone 2 on the Ringlemann scale. As a power unit, the regulation uses the kilojoule. The unabridged text of the regulation is given.

1972

44072 **APTIC NO. 66771**

Devitt, Timothy W. and Richard W. Gerstle

NATIONAL PERFORMANCE STANDARDS: REQUIREMENTS FOR COMPLIANCE WITH THE REGULATIONS. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 315-323. 7 refs. (April 20-21.)*

The National Performance Standards (NPS) and the requirements for compliance are discussed. National Performance Standards are established for specific types of sources and the regulations apply to more than one pollutant. Although NPS apply strictly to new or modified plants, they may also have significant impact on existing facilities. The Clean Air Act requires that states adopt and enforce specific emission limitations for existing sources similar to the sources subject to NPS. The NPS require that certain processes install and operate continuous emissions monitoring devices, and maintain records of emission monitoring results and production data. Emission limitations under the NPS and monitoring and record keeping requirements are outlined for the following processes: steam generators, incinerators, portland cement, nitric acid plant, and sulfuric acid plant.

44073 **APTIC NO. 66793**

Erskine, D. W.

CLEAN ENGINES. *Allis-Chalmers Eng. Rev., 37(4):20-22, 1972.*

Emission standards and test cycles developed by the State of California and the Industrial Truck Association for industrial trucks operating indoors (e.g., lift trucks) are reviewed. Maximum allowable standards for internal combustion engine exhaust emissions include: 2.3% carbon monoxide for 50-100 cu in engines, 2.0% CO for 100-140 cu in engines, and 1.5% CO for engines greater than 140 cu in. A typical test operating cycle includes the modes of idle, acceleration, load, and deceleration; parameters specified for each mode include revolutions per minute, intake vacuum, time in mode (sec), cumulative time (sec), percent time, and weighting factor. Certification test results are illustrated for a 153 cu in. engine used in 3500-5500 lb capacity lift trucks. Significant factors involved in arriving at the required emission levels are: intake manifold design, carburetor design, spark plug gap, positive crankcase ventilation, and engine timing. Effective maintenance programs are suggested for insurance of continued clean engine performance.

1969

44074 **APTIC NO. 67267**

McCune, Delbert C.

ON THE ESTABLISHMENT OF AIR QUALITY CRITERIA, WITH REFERENCE TO THE EFFECTS OF ATMOSPHERIC FLUORINE ON VEGETATION. *Boyce Thompson Inst. for Plant Research, Yonkers, N. Y., American Petroleum Inst., Air Quality Monograph 69-3, 36p., 1969. 66 refs.*

The establishment of air quality criteria for atmospheric fluorine is considered, with particular reference to the pollutants effect on vegetation. The problem of formulating criteria for ambient airborne fluorine is complex since the sequence of fluoride exposure may outweigh the influence of the actual fluoride level within a fumigation concentration range of 0.5-10 micrograms F/cu m. There can also be no single criterion for the effects of atmospheric fluorine on vegetation owing to the differences among plants in their susceptibility to fluorine and consequence of fluorine-induced effects. The form of atmospheric fluoride is also a factor that determines its phytotoxicity, and air quality standards or air monitoring techniques that consider only the total fluoride cannot be justified by present air quality criteria. The temporal distribution of atmospheric fluorine is another important factor in the evaluation of data or the selection of criteria; models for airborne fluorine are not yet derived or tested, and the relationships of peak values, sampling or averaging periods, and mean values are not known.

44075 **APTIC NO. 67268**

Smith, Ralph G.

AIR QUALITY STANDARDS FOR CARBON MONOXIDE. *Wayne State Univ., Detroit, Mich., Dept. of Occupational and Environmental Health, American Petroleum Inst., Air Quality Monograph 69-9, 23p., 1969. 20 refs.*

Existing levels of carbon monoxide, particularly in urban areas exposed to vehicular exhaust emissions are reviewed along with effects of CO exposure to humans in order to consider appropriate air quality standards for CO. Although CO is emitted to the atmosphere more than any other pollutant on a tonnage basis, it cannot be assumed that the magnitude of the problem is identical with the rankings resulting from such inventories. Also, CO produced by man is removed by some means from the atmosphere. Concern for CO levels is only appropriate in terms of possible human health effects from local and recent production of the gas since unlike many other pollutants CO does not persist or pose a global problem in terms of generation from anthropogenic activities. There does not appear to be adequate justification purely on the basis of health effects to support a standard more stringent than the level of 30 ppm over an 8-hr period adopted by the State of California in 1959. Regarding the monitoring of CO levels, non-dispersive infrared analysis appears to be the best method for continuous measurement until recording instruments based on gas chromatography or mercuric oxide reduction are developed.

44076 **APTIC NO. 67270**

Smith, Ralph G.

AIR QUALITY STANDARDS FOR LEAD. *Wayne State Univ., Detroit, Mich., Dept. of Occupational and Environmental Health, American Petroleum Inst., Air Quality Monograph 69-11, 18p., 1969. 51 refs.*

Studies on the effects of acute and chronic lead exposure to humans and animals, lead levels in biological samples, and atmospheric lead levels are reviewed in relation to the statement of air quality criteria for lead and possible lead air quality standards. Although there is a measurable quantity of lead in urban air, the level does not approach the only recognized health-protecting standard in the United States, the Threshold Limit Value of 200 micrograms/cu m for a 40-hour work week. Blood levels of people exposed to urban conditions where heavy vehicular traffic exists are only a fraction of the level proven to make the risk of occupational lead poisoning appreciable, though subclinical effects resulting from lesser exposures to lead must be considered for further resolution. Among the proposals made for an air quality standard for lead, a tentative air quality value of 10 micrograms/m averaged over 30 days is recommended by the American Industrial Hygiene Association.

LEGAL AND ADMINISTRATIVE

1974

44077 **APTIC NO. 66808**

Chatterji, Manas

A BALANCED REGIONAL INPUT-OUTPUT MODEL FOR IDENTIFYING RESPONSIBILITY FOR POLLUTION CREATED BY INDUSTRIES WHICH SERVE NATIONAL MARKETS. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 3, p. 101-114, June 1974. 6 refs.*

A balanced regional input-output model for identifying responsibility for pollution created by industries which serve national markets is described in mathematical terms. Vectors are set up for regional and national outputs and pollutants, total output, regional and national final demand, acceptable levels of pollution generated by the productive processes, and total final demand. Matrix coefficients are established to denote the input of regional good per unit output of regional good, the input of regional industry per unit output of national industry, the input of national industry per unit output of some regional industry, the input required of the national industry for the unit production of national industry, the input of regional industry per unit of pollutant abating activity, the input requirement from national industry per unit output of some pollutant abating industry, the output of some pollutant by unit output of a regional good, the output of some pollutant by unit level of output of the national industry, and the output of some pollutant per unit of activity of pollutant abating industry.

44078 **APTIC NO. 66874**

Cunningham, Robert G., Jr.

ENVIRONMENTAL IMPACT STATEMENTS--HISTORY AND APPLICABILITY. *TAPPI, 57(9):77-80, Sept. 1974. 8 refs. (Presented at the Technical Association of the Pulp and Paper Industry, Environmental Conference, New Orleans, La., April 16-19, 1974.)*

The National Environmental Policy Act was approved by President Nixon on Jan. 1, 1970. The Act provides in Section 102(C) that all Federal agencies must include in every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment a detailed statement relating to the environmental impact of the proposed action. Of particular importance is the impact of this provision as it relates to the development and implementation of Federal guidelines and standards for water quality and effluent limitations. Likewise, the provision affects projects such as interstate and local highways, dams, and flood control activities; the granting of licenses for developmental activities such as power plants; and other new industries which come under the licensing jurisdiction of the Federal Government. A brief history of the Act is given, its purpose is stated, and its impact upon our industrial society and economy is described, especially as it relates to the paper industry. Special attention is paid to the problem of establishing state and local permit conditions where such conditions are considered to be a significant Federal action requiring the filing of an environmental impact statement. The judicial interpretation of the act is also described. (Author abstract modified)

44079 **APTIC NO. 66707**

Freeman, L. Russell

NEVADA. AMENDMENTS TO AIR QUALITY IMPLEMENTATION PLAN. *Federal Register, 39(205):37506-37507, Oct. 22, 1974.*

Amendments to the Nevada Air Quality Implementation Plan are announced. The amendments to the sulfur emission regulations more explicitly define the authority for requiring the control of fugitive S emissions, to be used in conjunction with the Supplementary Control Systems article. The adopted revisions to the Visible Emissions article will enable continuous in-stack monitoring for particulates from the existing copper smelter in lieu of out-stack visual monitoring. Additional amendments were adopted to relax the S emission regulations for medium size electrical generating plants. These relaxed standards would allow smaller facilities to burn a fossil fuel with a higher S content, but because of their remoteness and limited size will allow Nevada to maintain its relatively clean air well below the national ambient air standards for sulfur oxides. Public comment is invited.

44080 **APTIC NO. 66671**

Inoue, Ichiro

PROBLEMS IN MEASUREMENT TECHNIQUES FOR FLUE GASES: FUTURE CONTROL AND REGULATION METHODS. *(Kogai boshi gijutsu no shinpo to kadai: korekara no kisei hoshiki no tsuite). Text in Japanese. Preprint, 8p., 1974. (Presented at the Heat Management Conference, Tokyo, Japan, June 24-27, 1974.)*

The only pollutant subject to the new total emission quantity regulation is, for the moment, sulfur oxides; nitrogen oxides and soot will probably be added later on. The areas subjected to the total emission standards are to be designated by the government ordinances, and the criteria for designation are the complexity and congestion of factories, plants, and workshops, and those areas that are having difficulty in attaining the present environmental standards. The subject factories are first designated by category by the office of the Prime Minister, and then designated in more specific terms by prefectural governors. The total emission quantity standards are determined by prefectural governors, and the methods are determined by the office of the Prime Minister. When the prefectural government is determining tht total quantity reduction plan, the total quantity standards, and the fuel standards, the designated areas can be divided into appropriate segments, with considerations for respective natural and social environments. The governors will be able to establish specially stringent standards for newly constructed facilities. For those factories not designated under the total emission standards, the governors can establish special fuel consumption and sulfur content standards as small-scale emission sources control measures.

44081 **APTIC NO. 66805**

Isard, Walter

REGIONAL SCIENCE AND RESEARCH ON ENVIRONMENTAL MANAGEMENT. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Environmental Protection Agency Research Grants R-800289 and R-801325, Regional Science Dissertation and Monograph Series 3, p. 1-46, June 1974. 121 refs.*

Regional science and related socio-economic techniques are examined in relation to environmental management, with the intention of exploring the potential of different combinations of techniques (channels of synthesis). A particular operational combination of techniques which is currently being examined in connection with a case study of the Watertown region of New York State is described in terms of the activity analysis data format, the input-output framework, comparative cost analysis, the subareal framework for projection, a dispersion model, and to some extent, a transportation model. Data are available for the region on land, air, and water use and on air and water pollutants and solid wastes by 4-digit Standard Industrial Classification codes. Crude estimates of selected air pollutants by source for one subarea are tabulated for particulates, sulfur oxides, sulfur dioxide, sulfur trioxide, carbon monoxide, hydrocarbons, and nitrogen oxides.

44082 **APTIC NO. 66806**

Isard, Walter

ACTIVITY - INDUSTRIAL COMPLEX ANALYSIS FOR ENVIRONMENTAL MANAGEMENT. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 3, p. 47-63, June 1974. 2 refs. (Presented at the European Regional Science Conference, Vienna, Austria, Aug. 1973.)*

The extension of activity-industrial complex analysis to encompass diverse pollutants emitted by various activities and their dispersion, taking into account their costs to society, is outlined. The analysis is performed in two basic parts: the first portion concerns those activities, whether production, transportation, consumption, or otherwise, or their segments whose inputs and outputs can be reasonably approximated by linear functions; the second part considers activities or their segments subject to significant nonlinear relationships. Expressions are given for the locational cost differential of an emitted pollutant, and changes in pollutant emissions due to the increments (decrements) to the transportation flow pattern from the development (removal) of an industrial complex are also considered. Adjusted vectors of advantages are obtained specifying the advantage of one region over another in terms of pollution costs.

44083 **APTIC NO. 66919**

Ishiguro, Tatsukichi

BAD ODORS IN FOOD INDUSTRIES AND RECENT PROBLEMS. *(Shokuhin kogyo no akushu to saikin no mondai). Text in Japanese. Nyu Fudo Indasutori (New Food Ind.), 16(8):2-7, Aug. 1974.*

Some recent advances in the control of odors in Japan are related. Legal concentration limits have been set for five chemicals (ammonia, hydrogen sulfide, methyl mercaptan, methyl sufide, trimethylamine) at the physical boundaries of the plants which emit them. Dimethyl amine, dimethyl disulfide, and acetadelhyde are to be added to the controlled odors list in 1974. Various prefectures and municipalities have been notified and given a timetable for cleaning up odors. Business enterprises are encouraged to do commonplace things to alleviate odor situations. However, many older Japanese plants are inferior to the European and American plants in design. In Northern European fishmeal and rendering (meal bonemeal, feathermeal) plants closed ductwork and slightly lowered pressure in the work environment keep odors from spreading. These plants are adaptable to Japanese processing industries, but proper engineering design tailored to the particular situation and constant monitoring of the system are more important than the mere importation of an expensive plant copy.

44084 **APTIC NO. 67236**

Iwamura, Einosuke

PROBLEMS IN MEASUREMENT AND ANALYSIS OF POLLUTION AND ENVIRONMENTS. *(Kogai kankyo sokutei bunseki no mondaitenni tsuite). Text in Japanese. Keisoku Gijutsu (Meas. Technol.), 2(7):36-41, July 1974.*

A special investigation commission was established in January 1974 for an evaluation of the state of implementation of the Japanese Industrial Standards for measurement and analysis of the environment. A questionnaire was given to 204 member firms of the Japan Association for environmental measurement and analysis business operators. The response was 77.4% in two weeks. Of the 158 responding organizations, 99 firms were companies limited, 21 were nonprofit foundations, 20 were part of industrial inhouse departments, seven were nonprofit corporates, and also seven were incorporates; therefore, 17.7% of the total number were nonprofit public organizations. Of these, 49% are concentrated in Tokyo, 26.5% in Osaka, 15.8% in Nagoya, and 5.7% in Fukuoka. The financial and capital scales, histories and work records, personnel, the scale of business and specialty, and facilities and equipment are discussed. According to the questionnaire responses, the following desires were expressed in common by various operators: unified opinions and evaluations are desired as criteria for sampling, pre-treatment, and test methods, and for equipment; in quantitating toxic substances, toxicity evaluation and standards are desired; instructions for methods of examining interferences and some methods that are free of interferences should be given; there are circumstances in which analysis is impossible immediately after sampling; and following the methods prescribed by the Japanese Industrial Standards can be quite expensive.

44085 **APTIC NO. 66591**

Jarrault

THESAURUS OF AIR POLLUTION TERMS IN FRENCH. *(Le thesaurus de la pollution atmospherique en language francaise). Text in French. Pollut. Atmos. (Paris), 16(62):259-265, April-June 1974. 5 refs.*

The first edition of the Air Pollution Thesaurus in French language, published in September 1973 upon initiative of C.I.T.E.P.A. (Interprofessional Technical and Study Center for Air Pollution) is described. The thesaurus, intended for use in computerized information processing and retrieval systems, is composed of 1800 descriptors and 700 mondescriptors, including modifiers and prohibited terms in equivalent, hierarchic and associative relations. The thesaurus is intended to increase the efficiency of documentation systems and to facilitate information between and access to documents of domestic and foreign institutions in an era of information explosion in the air pollution area.

44086 **APTIC NO. 66836**

Marlatt, William E.

ENVIRONMENTAL IMPACT ANALYSIS AND LAND USE PLANNING: A CONSERVATIONIST S VIEWPOINT. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 14p., 1974. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-250.)*

The national environmental objectives of the National Environmental Policy Act (NEPA) mandates that, from the initiation of preliminary planning of any project involving Federal lands through design, construction, and operation, all reasonable alternatives and measures for enhancing, protecting, and preserving the quality of the environment must be evaluated. In addition, the NEPA requires that the environmental assessment and impact analysis be utilized together with engineering, economic, social, and other considerations to insure balanced decision-making in the total public interest. In the 4 years since the NEPA was enacted, the environmental impact statement of this act has produced a large number of documents of highly variable quality and completeness of content. New guidelines are still forthcoming because of lacks in information and technology to prepare the impact statements. Case studies of proposed ski area developments at Marble, Colorado and an oil shale processing plant are reviewed to show the kinds of data inputs needed and the methods and limitations of analysis using inadequate data banks. The techniques, advantages, and shortcomings of the NEPA with regard to land use planning are described. (Author abstract modified)

44087 **APTIC NO. 66708**

O Connell, R. L.

STATE OF CALIFORNIA IMPLEMENTATION PLAN. NOTICE OF ACKNOWLEDGMENT. *Federal Register, 39(195):36031, Oct. 7, 1974.*

A revision to the State of California Implementation Plan for attaining and maintaining the National Ambient Air Quality Standards is summarized. The revision permits variances which include schedules of increments of progress. The revision provides that the rule or regulation limiting emissions may itself contain a schedule of increments of progress and that only persons who cannot comply with a schedule shall submit the required schedule or application for a variance to the hearing board. The revision permits the State Air Resources Board to modify and revoke variances granted by air pollution control districts if the variance is of excessive duration or does not comply with specified laws governing such districts.

44088 **APTIC NO. 66885**

Okita, T.

CURRENT SITUATION OF AIR POLLUTION IN JAPAN AND DESIRABLE FUTURE AIR MONITORING SYSTEM. *Proc. Int. Laser Radar Conf., 6th Conf. Laser Atmos. Stud., Sendai, Japan, 1974, p. 96-97. (Sept. 3-6, Paper VI-5.)*

The advent of petroleum as the major fuel in the 1960s in Japan and the increased number of chemical industries, automobiles, power industries, and other industries led to increased pollution by sulfur dioxide, nitrogen oxides, carbon monoxide, particulates, and oxidants. Oxidants have led to eye irritation, throat irritation, and plant injury. The Japanese government established the Environment Agency in 1971, and the following standards were set up: 0.1 ppm SO2 for 1 hr, 0.04 ppm SO2 for 24 hr, 0.02 ppm nitrogen dioxide for 24 hr, 20 ppm CO for 8 hr, 10 ppm CO for 24 hr, 0.06 ppm oxidant for 1 hr, 200 g/cu m particulates for 1 hr, and 100 g/cu m particulates for 24 hr. The air monitoring instruments currently employed in Japan: electroconductivity for SO2, Saltzman s method for NO2, nondispersive infrared spectrometry for CO, potassium iodide colorimetry for oxidants, and light scattering for particulates. Remote sensing will be important in the future.

44089 **APTIC NO. 66797**

Olin, John G. and Ronald L. Way

EXPERIENCE WITH MINNESOTA S TRANSPORTATION PLAN. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 34p., 1974. 11 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-243.)*

Minnesota s transportation plan to control motor vehicle emissions to comply with Federal ambient air quality standards is discussed. The plan consists of four major strategies: build parking lots on the fringe of the downtown area and provide shuttle buses to carry people from the lots to the office buildings; expand express bus service to downtown Minneapolis during the daily peak travel periods; complete downtown area freeways to divert traffic around the downtown area; and install and operate an automated traffic management system to reduce stop-and-go driving and increase average speed. The following minor strategies were also developed: voluntary carpooling, strict enforcement of existing ordinances and regulations, a public information program, and adoption of new ordinances and regulations restricting engine idling and downtown parking. Implementation of the transportation plan did lead to reduced carbon monoxide levels in Minneapolis.

44090 **APTIC NO. 67171**

Outwater, Eric B.

NEW YORK. STATE IMPLEMENTATION PLAN. *Federal Register, 39(225): 40786-40787, Nov. 20, 1974.*

A proposed revision to the New York State implementation Plan is presented and comments are solicited. The revision proposes to remove Suffolk County from the sulfur limitations of the New York City Metropolitan Area and to revise the sulfur in fuel requirements for distillate oil in the metropolitan area. The regulation for Suffolk County would become 2% sulfur for oil and 1.9 lbs/10 to the 6th Btu for solid fuel. A control strategy analysis for the area was used to project sulfur oxides concentrations to 1975. These concentrations were then used to determine necessary fuel standards.

44091 **APTIC NO. 66985**

Peklo, Peter and Karl Enders

EXPERIENCES WITH THE COOPERATION BETWEEN STATE-OWNED FORESTRY ENTERPRISES AND INDUSTRY CONCERNING REGULATION OF INDEMNIFICATION FOR SMOKE INJURIES AND REFORESTATION AS WELL AS CULTIVATION OF RESISTANT SPECIES. *(Erfahrungen ueber die Zusammenarbeit der Staatlichen Forstwirtschaftsbetriebe (StFB) und der Industrie ueber die Regulierung von Schadenersatz und die Durchfuehrung von Sanierungs- und Anpassungsmassnahmen bei Rauchschaeden in Waldbestaenden). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 63-73. 8 refs.*

In the Duebner moor of the German Democratic Republic mostly pines are grown. The industries on the western edge of the moor emit daily about 1300 tons of sulfur dioxide and about 900 tons of fly ash. The SO2 stems mostly (98%) from power plants fired with soft coal. Immission measurements of the SO2 and dust concentrations have been taken in the Duebner Moor since 1970 and revealed daily average concentrations of 0.08 mg SO2 and peak concentrations of 0.2 to 0.6 mg SO2/cu m. The fly ash raised the pH from 4 to 7 or 8 in a large part of the moor. The soluble fraction of the sedimentation dust was on the average 32%. After the extent of the injuries as well as the cause had been determined an agreement was worked out between the industry and the two state-owned forestry enterprises operating in the Duebener moor for payment of indemnification. Ten industrial enterprises were involved in the immissions. For determination of the share each enterprise had to pay, the extent and degree of smoke injuries in the Duebener moor was mapped. With the aid of a modified Sutton equation the immission fields of each individual source were calculated and overlapped to the total immission field. Lines of equal relative concentration are obtained which permit the determination of the share every source has in the total immission at a certain point in the smoke injured area.

44092 **APTIC NO. 66857**

Quarles, John

UTAH. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(203):37212-37215, Oct. 18, 1974.*

The approval and promulgation of the implementation plans for Utah are proposed and include a regulation for the Kennecott Copper Corp. copper smelter. The regulation requires the use of best engineering techniques for reducing the escape of sulfur oxides emissions to the atmosphere and the capture and venting of such emissions through the highest stacks serving the facility. No treatment of these captured emissions by sulfuric acid plants is presently required because of the low concentrations of sulfur dioxide in the gas stream. Adjustment of the maximum concentrations at the Beach Station site to account for the expected reduction in fugitive emissions results in an estimated maximum 24 hr concentration of SO2 less than 1.0 ppm.

44093 **APTIC NO. 66861**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. CERTIFICATION OF NEW VEHICLES INTENDED FOR INITIAL SALE AT HIGH ALTITUDE--1977 MODEL YEAR. *Federal Register, 39(203):37300-37305, Oct. 18, 1974.*

Regulations for the certification of new vehicles intended for initial sale at high altitude, 1977 model year are announced. Manufacturers must certify that vehicles which will be sold for initial licensing, registration, or titling at high altitudes are capable of meeting emission standards at such altitude. The Clean Air Act requires that all new vehicles wherever sold or operated meet the section 202 emission standards. Some manufacturers are expected to meet standards at high altitude by the production of two types of vehicles, one with a fixed calibration to meet the section 202 standards at high altitude and another calibrated to meet the standards at a nominally low altitude. Other manufacturers may produce automatically compensated vehicles, i.e., vehicles that meet standards at all altitudes. Enforcement policies and penalties are specified.

44094 **APTIC NO. 66863**

Quarles, John

APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. PENNSYLVANIA: APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(198):36481-36482, Oct. 10, 1974.*

The approval and promulgation of compliance schedules for Pennsylvania are announced. Each compliance schedule establishes a date by which an individual air pollution source must attain compliance with an emission limitation specified by the State Implementation Plan. In most cases, the schedules include incremental steps toward compliance with interim dates for achieving those steps.

44095 **APTIC NO. 66864**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. THE APPROVAL OF COMPLIANCE SCHEDULES FOR CALIFORNIA. *Federal Register, 39(201):36963-36964, Oct. 16, 1974.*

The approval of compliance schedules for California are announced. The schedules are consistent with the requirements of the Clean Air Act. The schedules consist of intermediate and final dates by which actions are to be taken by an air pollution source toward meeting applicable State or Federal emission limiting regulations. Each compliance schedule below establishes a new date by which the individual source must comply with applicable air pollution regulations. The schedules include incremental steps toward compliance with the applicable air pollution regulations.

44096 **APTIC NO. 66998**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. VIRGINIA; APPROVAL OF PLAN REVISION. *Federal Register, 39(220):40018, Nov. 13, 1974.*

Approval is given to a proposed revision to the Virginia State implementation plan for the attainment and maintenance of national ambient air quality standards. The revision deletes the existing preface to the state regulations for the control and abatement of air pollution which consisted of background information and policy statements.

44097 **APTIC NO. 66999**

Quarles, John

REGULATION OF FUELS AND FUEL ADDITIVES. ADMINISTRATIVE PROCEDURES FOR CHALLENGING LIABILITY AND PENALTY ASSESSMENT. *Federal Register, 39(219):39992-40001, Nov. 12, 1974.*

Proposed regulations are presented for rules for assessment of civil penalities with regard to regulation of fuels and fuel additives. The regulations explain the administrative proceedings and are being proposed for promulgation. The regulations establish a formal administrative hearing procedure to determine liability for penalties and their amount. The fact finding would be done by an Administrative Law Judge assigned to the Environmental Protection Agency or by an impartial Presiding Officer not connected with enforcement activities and his decision would be subject to review by the appropriate Regional Administrator. Judicial review of the final administrative decision would be available to determine whether it was unsupported by substantial evidence. The formal hearing procedure will only be used where less formal settlement negotiations between EPA and the alleged violator had failed to produce a mutually satisfactory agreement.

44098 **APTIC NO. 67002**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. KANSAS; APPROVAL AND DISAPPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(216):39436-39439, Nov. 7, 1974.*

Approved and disapproved revised compliance schedules for the Kansas state implementation plan are presented. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the Federally approved state implementation plan.

44099 **APTIC NO. 67169**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. NATIONAL AMBIENT AIR QUALITY STANDARDS; CALIFORNIA. *Federal Register, 39(216):39476, Nov. 7, 1974.*

Among the regulations promulgated for the California state implementation plan was a regulation for review of new sources and modifications. One paragraph provides that an owner or operator of a stationary source secure the approval of the Administrator before constructing or modifying any new source after the effective date of the regulation. A question has arisen whether the meaning of the term new source is identical with the definition of the term as provided in the Clean Air Act or whether the term is being used in its common definitional sense. To eliminate confusion, it is proposed to amend the subsection to delete the term new source and to substitute the term stationary source which is used elsewhere in the regulation. Comments are solicited.

44100 **APTIC NO. 67170**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVOCATION AND REVISION OF CERTAIN SECTIONS OF THE NEW JERSEY TRANSPORTATION CONTROL PLAN. *Federal Register, 39(222):40286-40287, Nov. 15, 1974.*

The New Jersey transportation control plan contained regulations prohibiting the pick-up and delivery of goods between 6 and 11 am from May 1 through Sept. 30 to control the emission of nonmethane hydrocarbons in the atmosphere from the use of volatile organic substances in order to reduce peak hour concentrations of photochemical oxidants. Since the regulation was ineffective in reducing the level of peak photochemical oxidant concentrations and caused minor enforcement problems, the Environmental Protection Agency is revoking the regulation and proposing a new section to require retrofit of gasoline-powered motor vehicles of 10,000 lbs gross vehicle weight or more. Also, a revision that will require the inspection and maintenance of such heavy-duty vehicles is proposed.

44101 **APTIC NO. 67186**

Quarles, John

NEVADA. SO2 CONTROL STRATEGY. *Federal Register, 39(209): 38104-38112, Oct. 29, 1974.*

Changes in the Nevada sulfur dioxide control strategy are proposed. The implementation plan for attainment and maintenance of the primary standards for sulfur oxides in the Nevada Intrastate Air Quality Control Region is disapproved. Substitute regulations are proposed for thy control of SO2 at the Kennecott Copper Corp. Smelter, McGill, Nev. In the regulations two emission limits are established as achievable with available constant control. These emission limits are an SO2 concentration limit on acid plant emissions and a mass emission limit for the entire smelter. The emission limit for the acid plant (2000 ppm) and the requirement that all converter gas must be processed by the acid plant are specified to assure full application of available constant control technology and to minimize emissions from the converters. A total plant emission limitation is specified based on the existing smelter configuration. An extension time to meet the primary standards is proposed.

44102 **APTIC NO. 67188**

Quarles, John

NEW YORK AND NEW JERSEY. APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(193):35686-35687, Oct. 3, 1974.*

The approval and promulgation of implementation plans for New York and New Jersey are announced. The plans provide for attainment and maintenance of the secondary standards for sulfur oxides in the following air quality control regions in New York State and New Jersey; Niagara Frontier Intrastate Region and the New York portion of the New Jersey-New York-Connecticut Interstate Region; Metropolitan Philadelphia and New Jersey-New York-Connecticut Interstate Regions. The only site which has exceeded air quality standards was on top of the engineering building of City College of New York. The high concentrations of sulfur oxides were directly related to the research at the building. The college installed a zinc oxide catalyst on the exhaust line to prevent the emission of unreacted hydrogen sulfide to the atmosphere.

44103 **APTIC NO. 67189**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. COLORADO IMPLEMENTATION PLAN FOR SULFUR OXIDES. *Federal Register, 39(203):37194-37195, Oct. 18, 1974.*

The approval of a proposed revision to the Colorado Implementation Plan for sulfur oxides is announced. A review of available air quality and emission data indicates that the national primary and secondary air quality standards for SOx are not being violated and that the control of existing sources is not necessary for thy maintenance of the national air quality standards within the State of Colorado. The requested revision to the Colorado plan is approved and the compliance schedules promulgated in Federal Register, vol. 38:22736 are withdrawn.

44104 **APTIC NO. 67250**

Quarles, John

AIR POLLUTION PREVENTION AND CONTROL. ADDITION TO THE LIST OF CATEGORIES OF STATIONARY SOURCES. *Federal Register, 39(207): 37807. Oct. 24, 1974.*

Notice is given that the Environmental Protection Agency Administrator amends the list of stationary sources to include coal preparation plants as a stationary source. Affected facilities include: thermal dryers, pneumatic coal-cleaning equipment (air tables), coal processing and conveying equipment (including breakers and crushers), screening (classifying) equipment, coal storage and coal transfer points, and coal loading facilities. Evaluation of other stationary source categories is in progress, and the list will be revised from time to time as the Administrator deems appropriate.

44105 **APTIC NO. 67190**

Ravan, Jack E.

ALABAMA; CLARIFICATION PLAN REVISIONS. *Federal Register, 39(188):34537-34538, Sept. 26, 1974.*

Clarification is given for a revision in the Alabama implementation plan concerning sulfur dioxide emission limits for fuel combustion sources. The Environmental Protection Agency Administrator approved the implementation plan with the exception of the revision on August 8, 1974. The modification of SO2 emission limits was based on an analysis made by the state which showed that an insufficient supply of fuels would be available to allow compliance with the regulations originally set forth in the state s implementation plan. The evaluation by EPA on the stringency of control needed in various portions of the Tennessee River Valley-Cumberland Mountains air quality control region was based on information provided by the state in its plan revision submittal, and the Agency performed no independent evaluation. Discussion will continue between Alabama and the Agency to determine the optimum course of action to be followed in respect to further changes in the state s SO2 regulations. Any additional changes will require extensive analysis to assure that no violation of primary standards will result.

44106 **APTIC NO. 67185**

Ravan, Jack E.

GEORGIA. PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(193):35681-35685, Oct. 3, 1974.*

Compliance schedules for the state of George are proposed. Each schedule establishes a date by which the individual source must attain compliance with an emission limitation or other regulation of the Georgia implementation plan. Public comment is invited.

44107 **APTIC NO. 66807**

Rose, Adam

A DYNAMIC INTERINDUSTRY MODEL FOR THE ECONOMIC ANALYSIS OF POLLUTION ABATEMENT. *In: Working Papers on the Use of Regional Science Techniques in Environmental Management. Cornell Univ., Ithaca, N. Y., Center for Urban Development Research, Regional Science Dissertation and Monograph Series 3, p. 65-100, June 1974. 10 refs.*

A dynamic input-output model of industrial air pollution generation and treatment by gas cleaning equipment amid economic activity is described in relation to assessing the economic consequences of environmental policy decisions. The model contains an economic component in which pollution abatement is conceived of as an integral part of each industry s production structure and a pollution abatement submodel which allows examination of all the various technological alternatives which might be used to meet a given air quality standard. A linear programming solution allows the determination of a likely response of industry to changes in environmental regulations and hence the examination of the underlying nature of the structural changes in the economy. Aside from the fact that the model s structural matrix is linked to time, the model is also dynamic in the sense that the net accumulation of pollution control equipment is determined endogenously with the aid of a special investment function.

44108 **APTIC NO. 66843**

Ruff, Ronald E. and Douglas G. Fox

EVOLUTION OF AIR QUALITY MODELS THROUGH THE USE OF THE RAPS DATA BASE. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 24p., 1974. 12 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-124.)*

The current status of the Environmental Protection Agency s Regional Air Pollution Study (RAPS) is reviewed. A major component of RAPS is the development of a large data base. The methodology used for collecting and accessing this data is outlined. The elements of the data base are specified in general terms. Examples of the use of currently available data bases for the development and validation of air quality simulation models are presented. On the basis of these studies, complex model development is warranted to improve air quality model performance. In order to improve the usefulness of these complex models, the emissions inventory and the meteorological information presented to them must be improved. (Author abstract modified)

44109 **APTIC NO. 66627**

Shimoda, Taisuke

ENVIRONMENTAL PROTECTION AND ADMINISTRATIVE GUIDANCE - THE CASE OF KANAGAWA PREFECTURE. *(Kankyo hozen to gyosei shido - Kanagawaken no baai). Text in Japanese. Toshi Mondai (J. Tokyo Inst. Munic. Res.), 65(7):43-53, July 1974.*

Kanagawa Prefecture has a population density of 2569/sq m and more than 20,000 factories in an area of 2400 sq km. In 1973, there were 2279 patients recognized by the government as pollution victims. The registered automobiles increased from 145,000 in 1960 to 1,074,700 in 1972. Pollution preventing regulations were first issued in this Prefecture in 1951 when industry showed signs of booming. In 1964, new regulations were issued, which requested registration of polluting facilities. Guidance was provided to plant owners and applicants to ensure that precautions were taken. The regulations were strictly enforced, and violators were warned, fined, and even forced to close their plants. The Congress passed new pollution regulations in 1970 on a national basis. The new regulations were very similar to the existing Prefectural regulation. A general plan was worked out in 1973 to preserve nature and to return green areas to the people.

44110 APTIC NO. 66992

Smith, Clifford V.

WASHINGTON. IMPLEMENTATION PLAN REVISIONS; NOTICE OF DELAY OF DECISION. *Federal Register, 39(214):39048-39049, Nov. 5, 1974.*

A final judgement has not been made on the proposed revisions to the Washington state implementation plan dealing with open burning. Supportive information has been requested and public comment has been solicited.

44111 APTIC NO. 66700

Smith, Clifford V., Jr.

OREGON. PROPOSED REVISION TO IMPLEMENTATION PLANS. *Federal Register, 39(199):36602-36603, Oct. 11, 1974.*

Proposed revisions to the Oregon implementation plans are announced. The revisions establish specific emission standards for fluorides and particulate matter for new and existing primary aluminum plants. For new plants total fluoride emissions cannot exceed 1.3 lb/mo/ton Al or 1.0 lb/yr/ton Al. Any one plant cannot exceed 12.5 ton/mo. Total particulate matter emissions cannot exceed 7.0 lb/ton of Al and an annual average of 5.0 lb/ton Al. Visual emissions from any source cannot exceed 10% opacity or 0.5 on the Ringelmann Smoke Chart. For existing plants, total fluoride emissions cannot exceed 3.5 lb/mo/ton Al or 2.5 lb/yr/ton Al. Any one plant cannot produce 22.0 tons F/mo. Total particulate emissions cannot exceed 13.0 lb/mo/ton Al or 10.0 lb/yr/ton Al. Visible emissions from any source cannot exceed 20% or 1.0 on the Ringelmann Smoke Chart. Regular monitoring and reporting of progress by the sources are required.

44112 APTIC NO. 66844

Smith, Maynard E.

DEFICIENCIES IN DATA AND ANALYSES FOR ENVIRONMENTAL IMPACT STATEMENTS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 18p., 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 9-13, 1974, Paper 74-126.)*

The requirement that all major facilities submit environmental impact statements has placed a severe strain on many scientific and technical disciplines in terms of manpower, capabilities, and available data. The shortage of suitable meteorological data, deficiencies in its application, and the programs for acquisition of new information are reviewed. The lack of information needed for cooling tower and aerodynamic downwash studies is highlighted, as are inconsistencies in governmental requirements for meteorological data. Environmental impact statements will continue to gain weight and lose quality until more emphasis is placed on thought and less on data. (Author abstract modified)

44113 APTIC NO. 66705

Svore, Jerome H.

KANSAS. APPROVAL OF COMPLIANCE SCHEDULES. *Federal Register, 39(193):35685-35686, Oct. 3, 1974.*

The approval of compliance schedules for Kansas are proposed. The schedules were reviewed and determined to be consistent with the approved control strategies of Kansas. Each approved revision establishes a new date by which the individual source must comply with the applicable emission limitation in the federally approved state implementation plan. The schedules include incremental steps toward compliance with the applicable emission limitations. Public comment is invited.

44114 APTIC NO. 66666

Tevis, Phillip G.

TECHNOLOGICAL MODIFICATIONS IN THE INTEREST OF ENVIRONMENTAL PROTECTION. A DECISION AID FOR BUSINESSMEN. *(Verfahrensaenderungen im Interesse des Umweltschutzes. Eine Entscheidungshilfe fuer den Unternehmer). Text in German. Chem. Ind. (Duesseldorf), 26(8):493-496, Aug. 1974.*

Analytical and decision-making procedures concerning technological modifications planned in the interest of environmental protection or for the reduction of material, energy, or labor costs of production as a measure to set off the costs of the legally required environmental protection measures in the production process is described. The existing technological process is checked with respect to possible modifications on the basis of the specific overhead per product or process step, after which the modifications considered and retained in process control, process design, and mechanical design are analyzed with respect to the financial resources required, the technical resources required, the risks involved, the potential financial reward, the time requirement, and the project visibility.

44115 APTIC NO. 66978

Tomczak, Hans-Joachim

PROBLEMS OF ENVIRONMENTAL PROTECTION ON THE SECTOR SOFT COAL INDUSTRY. *(Probleme des Umweltschutzes im Bereich der Braunkohlenindustrie). Text in German. In: Technik und Umweltschutz Luft - Wasser - Boden - Laerm, Luftverunreinigung bestimmter Gebiete und technologische Verfahren zur Emissionsverminderung. Vol. 5, Leipzig, VEB Deutscher Verlag fuer Grundstoffindustrie, 1974, p. 19-20. 1 ref.*

The conversion of soft coal to briquettes, coke, gas, and electric power causes considerable air pollution. In order to combat this pollution the limit values for emission of soft coal dust recommended by the East German guideline TGL 24663 have been declared binding for the coal industry. Furthermore, every individual refining plant has been ordered to revise the existing program for reduction of pollutant emission in order to meet the TGL limit values by Jan. 1, 1976. Apart from technical and technological measures a number of organizational and control measures are required to meet this goal.

44116 APTIC NO. 66856

Train, Russell E.

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES. REGULATIONS FOR CONTROL OF LIGHT DUTY DIESEL- POWERED TRUCKS. *Federal Register, 39(205):37610-37628, Oct. 22, 1974.*

Part 85 of Chapter I, Title 40 of the Code of Federal Regulations is amended to add Subpart D, applicable to light duty diesel trucks beginning with the 1976 model year. Except for the levels of standards, the regulations contain essentially identical provisions to those already promulgated for light duty diesel powered passenger vehicles. The levels of the emission standards are the same as for light duty gasoline fueled trucks, which are slightly higher than the interim 1975 standards for light duty passenger vehicles. These standards are expected to be met through the application of existing technology. Other changes to the regulations reflect the adoption of comments received on the proposed regulations. These changes included correcting errors in the proposal, and increasing the allowable temperature range of the heated hydrocarbon analytical system.

44117 APTIC NO. 66996

Train, Russell E.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. APPROVAL OF WASHINGTON IMPLEMENTATION PLAN REVISION COMPLEX (INDIRECT) SOURCES. *Federal Register, 39(226):40855-40857, Nov. 21, 1974.*

Revisions of the Washington state implementation plan are presented and proposed for approval. The revisions provide for preconstruction review and approval of indirect sources of air pollution to insure maintenance of standards. The revisions are described, comments on them are discussed, and approval is recommended.

44118 **APTIC NO. 66652**

Werner, Gerhard

WORK ON A MODEL IN DORTMUND. POLLUTION INDICES FOR A LARGE CITY. *(Modellarbeit in Dortmund. Belastungslinien fuer eine Grossstadt). Text in German. Umwelt (Duesseldorf), 4(5):37-39, 1974. 9 refs.*

A model for the evaluation of environmental pollution factors is presented. The model provides information on the extent of environmental pollution, evaluates the effect of pollution on urban residents, and can aid urban planning. Evaluation of the extent of pollution of a city requires the following operational steps: the pollution level to which a human being is exposed must be characterized by criteria or factors; measurements must be reproducible and a comparison must be feasible, which means that results must be expressed in standardized units; an importance factor must be attached to the obtained values; and the individual variables can then be aggregated to partial or total pollution values.

44119 **APTIC NO. 66997**

White, John C.

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. PROPOSED COMPLIANCE SCHEDULES FOR KENTUCKY. *Federal Register, 39(226): 40867-40871, Nov. 21, 1974.*

Additional compliance schedules for the Kentucky state implementation plan are presented and public comment on the proposed schedule is solicited. Each of the proposed compliance schedules establishes a date by which an individual air pollution source must attain compliance with an emission limitation of the state implementation plan.

44120 **APTIC NO. 66829**

California Air Resources Board, Technical Committee

SUGGESTED VAPOR RECOVERY RULES. *8p., June 13, 1974.*

Suggested vapor recovery rules for the state of California are outlined for transfer of gasoline into stationary storage containers and transfer of gasoline into vehicle fuel tanks. The rule pertaining to stationary storage containers stipulates that a person shall not transfer or permit the transfer of gasoline from any truck or trailer into any stationary storage container with a capacity of more than 250 gal unless such container is equipped with a submerged fill pipe and unless 90% by volume of the gasoline vapors displaced during the filling of the container are prevented from being released to the atmosphere. Transfer of gasoline into any motor vehicle fuel tank of greater than 5 gal capacity is not permitted unless such transfer is made in a manner by which the emissions to the atmosphere of the gasoline vapors displaced during filling of the vehicle tank are reduced also by at least 90% by volume. Cases where the provisions of these two rules do not apply are also stipulated.

44121 **APTIC NO. 66848**

Research Triangle Inst., Research Triangle Park, N. C., Environmental Studies Center and PEDCo Environmental Specialists, Cincinnati, Ohio

GUIDELINES FOR AIR QUALITY MAINTENANCE PLANNING AND ANALYSIS, VOLUME 3, CONTROL STRATEGIES (FINAL REPORT). *Environmental Protection Agency Contract 68-02-1386, Task 1, Rept. EPA-450/4-74-003, OAQPS 1.2-022, 185p., July 1974. 88 refs.*

Eighteen measures that are used or proposed for use in maintaining air quality standards in regional areas are described. Information includes: case histories, recommendations for implementing the measure, estimates of potential effectiveness, and conditions under which the measure is most applicable. Many of the measures reviewed are based on land use or regional planning, and are concerned primarily with new sources of emissions. These include: emission allocation procedures, regional development planning, emission density zoning, zoning approvals, transportation controls, emission charges, transfer of emission source location, indirect source review, and environmental impact statements. Other measures are technological: new source performance standards, more stringent control of existing sources, phaseout or prohibition of emission sources, fuel conversion, energy conservation and utilization, combination of emission sources, special operating conditions, stack height regulations, and control of fugitive dust sources. (Author abstract modified)

1973

44122 **APTIC NO. 67360**

Blokker, P. C.

MAJOR ASPECTS IN AIR POLLUTION MONITORING IN URBAN AND INDUSTRIAL AREAS. *Stichting CONCAWE, Hague (Netherlands), Rept. 7/73, 39p., Sept. 1973. 16 refs.*

A guide to air pollution monitoring in urban and industrial areas is given. Monitoring system design depends on the objectives, the existing pollution levels, their variability, the size of the region, and the type of pollutant. These parameters are discussed, as well as their influence on the number of stations needed, the sampling time, and the location of the sampling sites. For deciding on the network required, some prior knowledge of the level of pollution and its variability is needed. The number of stations needed is highest when the object is to determine means, especially daily means and when the region is heterogeneous, e.g., industry surrounded by domestic housing. For determining cumulative frequency distributions or geographic distributions, the requirements of stations are less severe. If random sampling is applied, a great reduction in the frequency of sampling and number of samples per day is often admissible. Morever, it can provide more information on the geographical variation. However, labor costs are usually higher with random sampling than with fixed sampling stations. (Author abstract modified)

44123 **APTIC NO. 66724**

DeMarco, Jack, Daniel J. Keller, Jerold Leckman, and James L. Newton

CONTROL OF AIR POLLUTION ORIGINATING FROM FEDERAL INSTALLATIONS. *In: Municipal-Scale Incinerator Design and Operation (formerly titled Incinerator Guidelines--1969). Appendix B, Dept. of Health, Education, and Welfare, Washington, D. C., Bureau of Solid Waste Management, Public Health Service Rept. 2012, p. 91-98, 1973.*

GPO

The Executive Order for the control of air pollution originating from Federal installations and the resulting amendment to the Code of Federal Regulations are presented. The Order set policy for the prevention, control, and abatement of air pollution from Federal installations. Authority was given to the Secretary of Health, Education, and Welfare to set standards for the emission of fly ash and particulate matter; for sulfur oxides emissions; for installation of tall chimneys; for storage of solid fuels and ash; for disposal of refuse; and for elimination of emissions of pollutant dusts, fumes, or gases that would endanger health or welfare. Subchapter F of Title 42 Code of Federal Regulations was amended by adding a new Part 76: Prevention, Control and Abatement of Air Pollution from Federal Government Activities: Performance Standards and Techniques of Measurement.

44124 **APTIC NO. 67279**

McGuire, Terry W. and Peter D. Venturini

REGULATING EMISSIONS FROM SERVICE STATION OPERATIONS - A VIEW POINT. *American Petroleum Inst., Washington, D. C., California Air Resources Board, Environmental Protection Agency, Washington, D. C., Los Angeles Air Pollution Control District, Calif., Orange County Air Pollution Control District, Calif., Petroleum Equipment Inst., Tulsa, Okla., Western Oil and Gas Assoc., Los Angeles, Calif., Veh. Refueling Emiss. Semin. Proc., Anaheim, Calif., 1973, p. 22-23. (Dec. 4-5, 1973.)*

The problem of hydrocarbon vapor emissions from service station operations is considered with particular reference to regulatory considerations for the state of California. Emissions statewide from service stations account for about 28 million gallons (1972 figures), with displaced vapors from vehicle refueling operations amounting to about half of the emissions. Working losses of vapor displacement from underground tanks are on the order of 40%, while losses associated with spillage and with breathing in the underground tanks are around 10% of the total. The California implementation plan contains considerations with regard to control of such emissions, and the counties of Los Angeles, Orange, San Diego, and the Bay Area Air Pollution Control District have new regulations dealing with the subject to various degrees. Revisions are underway to provide for the adoption of such regulations by other districts also. Basic considerations involved in developing the regulations include: the degree of control necessary, factors of cost, effectiveness, and technical feasibility, uniformity in test procedures and regulations throughout the state, and possible exemptions of certain very small, low-volume service station operations where controls would be very costly and would not really effect a significant reduction in emissions.

44125 **APTIC NO. 67008**

Rocco, Vincent A.

EVALUATION OF CRITICAL HIGHWAY PROJECTS IN THE AIR QUALITY PLANNING PROCESS. *Highway Res. Rec., no. 465:67-74, 1973. 9 refs.*

NTIS: PB 227144

Highway planning agencies are now required to assess in detail the impacts of proposed facility improvements and newly located roads on corridor ambient air quality. Experience on numerous projects throughout the nation has shown that such assessments generally require lengthy, comprehensive evaluations of corridor meteorology, preconstruction ambient air quality, post- construction traffic growth and redistribution effects, gross emission generation, and pollutant dispersion characteristics. The definition of the several elements required for a comprehensive highway air quality impact assessment must be undertaken at the earliest planning stage so that all necessary studies and field surfaces can be initiated in parallel with other aspects of the location study or environmental impact evaluation. A novel procedure is described by which the transportation planner can determine whether detailed air quality studies are warranted for a proposed route alternate under consideration. The environmental capacity of critical average daily traffic of a given road is defined as a function of readily available highway planning parameters. A series of capacity curves and planning criteria are presented that describe maximum average daily traffic volumes that can be tolerated under generalized, most adverse meteorological conditions before the national ambient air quality standards for carbon monoxide and hydrocarbons will be exceeded at a given distance from the edge of the roadway. Use of this methodology affords a direct, valid means for structuring highway air quality studies and for direct assessment of air quality impact of proposed highways in suburban and rural environments. (Author abstract modified)

44126 **APTIC NO. 67007**

Skog, John, Earl Shirley, and Andrew Ranzieri

THE QUANTITATIVE AIR QUALITY REPORT. *Highway Res. Rec., no. 465:55-66, 1973. 6 refs.*

NTIS: PB 227144

A series of field observations and mathematical analyses are presented in an effort to answer questions posed in the preparation of an environmental impact statement. The significant primary pollutants (carbon monoxide, hydrocarbons, oxides of nitrogen, sulfur oxides, and particulates) produced from stationary as well as mobile sources are tabulated. Federal and California air quality standards based on results of investigations on the effects of pollutants are presented. The component parts of an air quality study are discussed. Transport and dispersion of pollutants depend on topography and meteorology, and the procedure to be adopted in their study is outlined. The use of a mathematical model in analyzing pollutant concentration in the microscale is described as is mesoscale analysis. Ambient air quality defines the background levels of pollutant concentration. Data gathering in ambient air quality studies is discussed. Guidelines on data presentation and summarization (written and tabular) and methods of graphical representation are provided. The need for research to quantify the various factors is stressed. (Author abstract modified)

44127 **APTIC NO. 67004**

Venezia, Ronald A.

IMPLICATIONS FOR TRANSPORTATION OF NEW FEDERAL AIR POLLUTION CONTROLS. *Highway Res. Rec., no. 465:14-20, 1973. 3 refs.*

NTIS: PB 227144

A concise legislative history of Federal air pollution control efforts terminating with the Clean Air Amendments of 1970 provides the basis for a discussion of the implications of compliance with Federal ambient air quality standards. A major implication is the need in numerous urban areas for transportation controls, control mechanisms not addressed by most of the state implementation plans submitted to the Environmental Protection Agency in Jan. 1972. The rollback methodology used in predicting future air quality caused by projected emission reductions is reviewed. Inherent data base uncertainties and basic technological and socioeconomic assumptions employed are discussed. The use of a comprehensive systems analysis approach for evaluating the externalities of selected implementation plan control strategies is strongly endorsed. The control strategies used in the state implementation plans include traffic controls, parking restrictions, retrofit systems, inspections, gaseous fuel systems, public transportation improvements, work schedule changes, and land use controls. An appendix gives the pollutants requiring transportation and land controls and the justifications for extensions in formulating implementation plans for various states. (Author abstract modified)

44128 **APTIC NO. 66799**

Weber, E.

LEGAL DIRECTIVES FOR AIR POLLUTION ABATEMENT AND REFLECTIONS ON EMISSION CONTROL. *Beckman Instruments Process S.A., Geneva (Switzerland), Proc. Int. Symp. Environ. Meas., Geneva, Switzerland, 1973, p. 107-112. 2 refs. (Oct. 2-4.)*

In 1971, the West German Government launched an environmental program including elaboration of the legal directives for environmental protection. Since the responsibility for clean air legislation falls partly within the jurisdiction of the Federal Government and partly within the Land Governments, enforcement is difficult. Air pollution laws have been available since 1869 in Germany. Although there is no uniform law, the civil and public laws, decrees, administrative instructions, and guidelines all complement and overlap. The 1971 long-term programs included the Federal Law for Environmental Protection which is based on the resolution adopted by the Ministerial Committee of the European Council on March 8, 1968. Two projects are under way which will become very important for future clean air measures enforcing the Federal Environmental Law. They are an emission inventory in Cologne and an air hygienic meteorological model study in the Lower Main region. These are reviewed.

44129 **APTIC NO. 67006**

Wickstrom, G. V.

AIR POLLUTION: IMPLICATIONS FOR TRANSPORTATION PLANNING. *Highway Res. Rec., no. 465:46-54, 1973. 1 ref.*

NTIS: PB 227144

The need to integrate air quality considerations into the long-range transportation planning process is discussed. Eight recommendations for incorporating air quality planning into the transportation planning processes are given using illustrations from the Washington, D. C., metropolitan area. Because air quality is a regional problem, solutions must be sought and implemented on regional and local scales; the kind of solution will vary depending on the time frame considered. The interaction between transportation and land use must be considered fully if correct solutions are to be found. Central area parking policy should become an integral part of the transportation planning process. The benefits of alternative actions should be stated clearly and the impacts to private and public groups estimated. Alternative land use policies and alternative transportation policies should be examined. A planning process that is responsive to evaluating alternative courses of action is required. Continuing process improvements, monitoring, and feedback are essential. (Author abstract modified)

44130 **APTIC NO. 66792**

DECLARATION OF THE COUNCIL OF THE EUROPEAN COMMUNITIES AND OF THE REPRESENTATIVES OF THE GOVERNMENTS OF THE MEMBER STATES MEETING IN THE COUNCIL OF 22 NOVEMBER 1973 ON THE PROGRAMME OF ACTION OF THE EUROPEAN COMMUNITIES ON THE ENVIRONMENT. *Off. J. Eur. Communities, 16(C112):1-53, Dec. 20, 1973.*

A program of action is outlined for environmental policy of the European Communities. Objectives and principles of the Community environmental policy are outlined along with a general description of the action to be taken at the Community level during the next two years. Detailed descriptions are presented in relation to the following: objective evaluation of the risks to human health and the environment from pollution; the setting of standards; exchange of information between surveillance and monitoring networks; measures relating to certain products; actions specific to certain industrial sectors, energy production and, certain areas of common interest; actions concerning wastes and residues; compliance with the limits established for the protection of the environment; and dissemination of knowledge relating to environmental pollution. Actions to improve the environment and Community action or joint action by the member states in international organizations are also outlined. Air pollutants for priority investigation chosen because of their toxicity and the current state of knowledge of their significance in health and ecological fields are: suspended particulates, sulfur compounds, nitrogen oxides, carbon monoxide, photochemical oxidants, asbestos, and vanadium.

1972

44131 **APTIC NO. 66770**

Martin, William B.

PRIVATE ENVIRONMENTAL LITIGATION. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 33-48. 43 refs. (April 20-21.)*

Private environmental litigation is discussed including causes of action, advantages, and disadvantages. Common law cause of action is based upon nuisance, trespass, negligence, and strict liability. Other legal theories which may be adaptable to the private pollution suit are the law of product liability, antitrust suits, maritime suits, shareholder suits, inverse condemnation, public trust, the Civil Rights Act, and the creation of the environmental bill of rights. Litigation is expensive and common law remedies are inconvenient. The Courts are generally unable or unwilling to administer standards uniformly, and to render quick action in the cases they handle. Private lawsuits are essentially a supplemental device. They serve as a safety valve which offers every citizen a private remedy for private damage.

44132 **APTIC NO. 66721**

Meijer-Drees, F. J.

LEGAL ASPECTS OF AIR POLLUTION CONTROL. *(Juridische aspecten van de wet bestrijding luchtverontreiniging). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/ Brussels, Intermediair, 1972, p. 361-379. 25 refs.*

Historical overview is given of environmentally related legislation in the Netherlands, and a critical description of the 1970 Air Pollution Act is presented. The Act contains provisions regarding air pollution in general, as well as regarding equipment, fuels, and activities generating air pollution, and deals with the financial, administrative, and penal aspects of air pollution prevention. However, there are no pollutant concentration standards included. The concentration standards, now under consideration, should be set with regard to the current and expected pollution levels. The Air Pollution Act can not be regarded as adequate or efficient, and further improvement in the air pollution area will require joint efforts by experts on the national, provincial, and local levels.

44133 **APTIC NO. 66768**

Ravan, Jack E.

EPA INVOLVEMENT IN ENVIRONMENTAL QUALITY CONTROL IN REGION IV (SOUTHEAST). *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 1-13. (April 20-21.)*

The provisions of the Clean Air Act of 1967 and the 1970 Amendments are described. The Clean Air Act established the first significant Federal involvement in the area of air pollution control. This act set forth clearly the primary responsibility of the States for air pollution abatement. Procedures were provided for issuing air quality standards; for setting up atmospheric areas and air quality control regions; and to set up air quality standards and to adopt a plan to implement them. The Amendments required the establishment of national primary and secondary air quality standards. Each state is required to be responsible for air quality within its own boundaries and must adopt, after public hearings, plans for implementing, maintaining, and enforcing air quality standards which are acceptable to the Environmental Protection Agency. The National Environmental Policy Act is also discussed.

44134 **APTIC NO. 66776**

Stewart, Robert E. and Therman L. Hardison

THE IMPACT OF COAL BURNING POWER PLANTS ON AIR QUALITY. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 395-417. 4 refs. (April 20-21.)*

Annual average ground-level concentration patterns of sulfur dioxide were determined for four regions within the western Kentucky area. Emission inventories from existing coal burning power plants, from plants under construction, and from proposed plants within each region as well as complete meteorological data from the major airport within each region were used as input information to a diffusion model. Practically no SO2 pollution problem exists or will exist on an annual basis for plants having stacks of 300 ft or higher. The proposed Implementation Plan for Kentucky limits the SO2 release rate to 1.2 lb/million BUT/hr input regardless of the stack height. The plan would require an SO2 removal efficiency of 75% which is beyond present day technology. The combined effect of stack height and SO2 release rate should be considered rather than release rate alone in formulating emission standards. (Author abstract modified)

44135 **APTIC NO. 66769**

Sullivan, Thomas F. P.

A SURVEY OF NATIONAL ENVIRONMENTAL QUALITY CONTROL LEGISLATION. *Louisville Univ., Ky., Speed Scientific School, Environ. Eng. Sci. Conf., Proc. 2nd Annu. Meet., Louisville, Ky., 1972, p. 15-30. (April 20-21.)*

National environmental quality control legislation is surveyed including the Clean Air Act. The Clean Air Act is divided into three separate titles: Air Pollution Prevention and Control Activities, Emission Standards for Moving Sources, and a general section. The Act leaves the primary responsibility for air quality with the state and provides that each state is to submit plans to comply with the national primary and secondary ambient air quality standards to be achieved and maintained. The Act provides that the Environmental Protection Agency provides standards for each air pollutant. The first list covers: sulfur dioxide, particulate matter, carbon monoxide, photochemical oxidants, hydrocarbons, and nitrogen dioxide. Other environmental legislation includes the National Environmental Policy Act, the Environmental Quality Improvement Act of 1970, the Department of Transportation Act, The Federal Aid Highway Act, the Airport and Airways Development Act, and the Public Health Service Act. There is legislation covering water pollution, solid wastes, pesticides, and radiation. There is pending legislation taxing SO2 15 cents/lb of SO2 in areas where federal air quality standards have not been met.

44136 **APTIC NO. 67315**

Kawasaki City Public Damage Bureau (Japan), Public Damage Surveillance Center

THE KAWASAKI CITY PUBLIC DAMAGE SURVEILLANCE CENTER. *(Kawasaki shi kogai kanshi senta). Aug. 1972. Translated from Japanese. Translation Consultants, Ltd., Arlington, Va., 45p.*

The Kawasaki City Public Damage Surveillance Center is described. Its automatic air pollution surveillance system, environmental air pollution surveillance system, automatic generation source sulfur dioxide surveillance system, and surveillance stations and data handling procedures are described. The administration of the Center is also outlined. The automatic environmental air pollution surveillance system transmits telemetered data on the main air pollutants from the base measurement points and the relevant data concerning wind direction, wind speed, and other meteorological data to the Public Damage Surveillance Center. The source SO2 surveillance system exercises surveillance and control by transmitting telemetered data concerning the SO2 concentrations emitted from and the quantity of fuel used by the 42 large factories which are the principal SO2 emission sources. The Center also monitors automotive exhausts at several intersections and photochemical smog using a measurement van.

1971

44137 **APTIC NO. 67289**

Bechthold, James L.

PRESENT AND FUTURE REQUIREMENTS OF ENVIRONMENTAL MONITORING PROGRAMS - ELECTRIC POWER UTILITIES. *Instrument Society of America, Pittsburgh, Pa., Instr. Soc. Am. Annu. Conf., 26th, Chicago, Ill., 1971, 5p. 2 refs. (Oct. 4-6, Paper 71-875.)*

Current environmental data acquisition systems of the Northern States Power Company are described along with projected monitoring requirements for future ambient air quality standards. Present environmental monitoring programs involve the location of air quality stations around electrical plants based on the annual wind rose. Continuous readings of sulfur dioxide, coefficient of haze, wind speed and direction, and airborne radionuclides (for nuclear stations) are taken. Proposed federal standards published in the Federal Register (1971) state that sulfur dioxide be measured by a modified pararosanaline method or by a coulometric and flame photometric method in a continuous instrument as opposed to the conductometric SO2 analyzer used by the Northern States Power Company in Minnesota. The high volume sampler and continuous tape sampler are proposed by the federal government for suspended particulates measurement; this differs from the Minnesota regulations, and, if required, would mean a drastic change in equipment requirements for the utilities in Minnesota. Nitrogen dioxide standards developed by the Environmental Protection Agency which are not presently imposed within the state of Minnesota will require the installation of monitoring devices which are capable of at least measuring concentrations down to 0.02 ppm. A list is given of EPA survey requirements in terms of sampling method, minimum number of air quality monitoring sites, and minimum frequency of sampling for suspended particulates, sulfur dioxide, carbon monoxide, nitrogen dioxide, and oxidants.

GENERAL

1974

44138 **APTIC NO. 66590**

Sueishi, Tomitaro

THE CONVERSION PROCESS FOR NEW TYPES OF ENVIRONMENT. *(Kankyogata e no tenka no shiso). Text in Japanese. Kankyo Sozo (Environ. Creation), 4(9):41-46, Sept. 1974.*

An ideal environment is such that all the inhabitants in it are totally unaware of the environment. The living environment is so complex that it cannot be evaluated by the level of living or living facilities it provides; nor can we measure safety, wholesomeness, convenience, and comfort. However, it a system itself can be simulated, the natural ecology has a way of arriving at a balance, and the environment will improve by itself. An environmental type is a total system including conversion processes hypothetically set for arriving at such an ideal stage by solving each stage of what is defined as a shadow or invisible system which composes natural ecology. The structural matrix and various vectors for approximating the present environment to a balanced natural environment are obtained and mathematical equations are presented.

1972

44139 **APTIC NO. 66718**

Hermans, K. H.

DETERMINATION OF ENVIRONMENTAL POLLUTION-GENERATED DAMAGES. *(Het vaststellen van schade door milieuverontreiniging). Text in Dutch. In: Milieubalans van Nederland. J. J. Mulckhuyse (ed.), Amsterdam/Brussels, Intermediair, 1972, p. 117-128. 18 refs.*

General problems of damages afflicted by pollution and contamination to the natural environment, and methods for their determination are described. The detection of damages caused by pollution is complicated by the fact that pollutant levels below a certain limit generate invisible damages. The potentiality of damage is characterized by the tolerance of the living organism or the absolute or relative maximum allowable concentration. Plant damages caused by air pollutants can be determined by systematic pollution monitoring and by aerial photographs. Extensive damages in coniferous forests from sulfur dioxide, fluorine compounds, peroxyacetyl nitrate, and peroxybutyryl nitrate were observed in Europe.

SUBJECT INDEX

A

ABATEMENT
43814, 44053, 44057, 44080, 44109, 44123, 44128, 44133, 44138

ABSORPTION (CONTROL)
43562, 43567, 43580, 43608, 43621, 43630, 43645, 43654, 43659, 43670, 43674, 43678, 43727, 43735, 43806, 43808, 43824, 43910, 43921, 43922, 43934, 43944

ABSORPTION (GENERAL)
43566, 43586, 43603, 43623, 43684, 43708, 43709, 43732

ACETALDEHYDE
43831, 44030, 44083

ACETIC ACID
44015

ACETONE
43659, 43831, 43898, 43939

ACETYLENES
43809, 43927

ACROLEIN
43526

ACUTE
44002, 44004, 44076

ADSORPTION (CONTROL)
43564, 43565, 43591, 43598, 43611, 43615, 43617, 43641, 43644, 43645, 43654, 43659, 43661, 43672, 43690, 43696, 43697, 43701, 43735, 43790, 43796, 43891, 43923, 43925, 43929, 43934, 43947, 44066

ADSORPTION (GENERAL)
43565, 43623, 43672, 43712, 43926, 43947

ADVECTION
43897, 43920

ADVISORY SERVICES
44109

AERODYNAMICS
43748, 43931

AEROSOL ATOMIZATION
43783, 43955

AEROSOL DIFFUSION AND BROWNIAN MOTION
43881

AEROSOL PHENOMENA
43507, 43581, 43597, 43614, 43625, 43711, 43744, 43752, 43754, 43766, 43768, 43771, 43782, 43783, 43801, 43802, 43822, 43828, 43847, 43850, 43854, 43857, 43870, 43875, 43879, 43880, 43881, 43887, 43908, 43931, 43946, 43955, 43958, 43961, 43985, 43994, 44004

AEROSOLS
43506, 43536, 43590, 43752, 43766, 43778, 43779, 43783, 43792, 43806, 43822, 43824, 43828, 43833, 43838, 43849, 43850, 43854, 43857, 43861, 43862, 43875, 43879, 43880, 43881, 43884, 43885, 43886, 43887, 43895, 43903, 43908, 43909, 43910, 43911, 43913, 43914, 43915, 43917, 43918, 43919, 43931, 43943, 43946, 43950, 43955, 43958, 43982, 43996, 43999

AFRICA
43574, 43842, 44011

AGRICULTURAL CHEMICAL PLANTS
43629, 44068

AGRICULTURE INDUSTRY
44032

AIR CONDITIONING EQUIPMENT
43573, 43585, 43643, 43650, 43823, 43989, 43992

AIR POLLUTION EPISODES
43551, 43760, 43786, 43880, 43902, 44002, 44010, 44042

AIR POLLUTION FORECASTING
43510, 43511, 43832, 43864, 43874, 43894, 43896, 43911, 43916, 44125

AIR QUALITY CRITERIA
44004, 44074

AIR QUALITY MEASUREMENT PROGRAMS
43505, 43519, 43535, 43765, 43786, 43805, 43814, 43820, 43824, 43828, 43839, 43840, 43846, 43850, 43877, 43880, 43897, 44088, 44108, 44118, 44122, 44126, 44128, 44136, 44137

AIR QUALITY STANDARDS
43528, 43548, 43685, 43777, 43819, 43962, 43965, 43969, 43976, 43996, 44059, 44070, 44075, 44076, 44080, 44083, 44099, 44102, 44103, 44125, 44126, 44127, 44133, 44134, 44135, 44137

AIR RESOURCE MANAGEMENT
43531, 43558, 44052, 44057, 44077, 44081, 44082, 44107, 44129, 44130

AIR-FUEL RATIO
43530, 43549, 43557, 43596, 43692, 43713, 43720, 43729, 43746

AIRCRAFT
43514, 43538, 43748, 43803, 43850, 43858, 43873, 43883, 43885, 43890, 43893, 43905

ALABAMA
44105

ALASKA
43920

ALCOHOLS
43506, 43512, 43555, 43567, 43577, 43591, 43604, 43609, 43649, 43667, 43719, 43790, 43831, 43863, 43904

ALDEHYDES
43506, 43521, 43526, 43532, 43577, 43610, 43657, 43688, 43805, 43831, 43844, 43904, 43938, 43948, 43951, 43957, 44004, 44016, 44030, 44083

ALERTS
43760, 43786

ALFALFA
43557

ALKALINE ADDITIVES
43586, 43603, 43684, 43705, 43708, 43709, 43719, 43732

ALLERGIES
43506, 43989, 43991, 43992, 43998

ALUMINUM
44066, 44111

ALUMINUM COMPOUNDS
43795, 44025

ALUMINUM OXIDES
43654, 43923, 43926

ALVEOLI
43982, 43993, 43994

AMIDES
43944

AMINES
43577, 43659, 43789, 43969, 44083

AMINO ACIDS
43789, 44006, 44027, 44037

AMMONIA
43506, 43512, 43518, 43526, 43591, 43648, 43655, 43659, 43667, 43760, 43790, 43799, 43844, 43865, 43893, 43917, 43944, 43952, 44036, 44042, 44083

AMMONIUM COMPOUNDS
43506, 43512, 43518, 43526, 43591, 43648, 43655, 43659, 43667, 43752, 43760, 43790, 43799, 43826, 43844, 43865, 43893, 43917, 43944, 43952, 44036, 44042, 44083

ANIMALS (NON-HUMAN)
43865, 43960, 43963, 43965, 43972, 43974, 43975, 43980, 43983, 43984, 43988, 43993, 44006, 44007, 44008, 44011, 44046

ANTIBODIES
43992

ANTICYCLONES
43856

ANTIGENS
43989, 43992

ANTIMONY COMPOUNDS
43838

AREA EMISSION ALLOCATIONS
44121

AREA SURVEYS
43519, 43535, 43828, 43839, 43840, 43846, 43850, 43880, 43897

AROMATIC HYDROCARBONS
43555, 43573, 43774, 43789, 43799, 43809, 43814, 43939, 43969, 43975

ARSENIC COMPOUNDS
43761, 43838, 43964, 44036

ASBESTOS
43533, 43966, 43997, 44011, 44067, 44130

ASHES
43848

ASTHMA
43989, 43992, 44005

ATMOSPHERIC MOVEMENTS
43528, 43534, 43582, 43805, 43827, 43832, 43835, 43839, 43850, 43852, 43854, 43856, 43864, 43865, 43873, 43874, 43877, 43886, 43892, 43896, 43897, 43898, 43905, 43907, 43911, 43920, 44137

AUSTRALASIA
43641, 43842, 43971

AUSTRALIA
43641, 43842, 43971

AUTOMATIC MEASUREMENT METHODS
43666, 43760, 43791, 43810, 43814, 43822, 43823, 43824

AUTOMOBILES
43507, 43519, 43527, 43528, 43532, 43546, 43550, 43551, 43604, 43609, 43651, 43681, 43686, 43692, 43701, 43702, 43717, 43724, 43751, 43792, 43820, 43908, 43942, 43972, 43976, 43985, 44002, 44003, 44053, 44054, 44057

AUTOMOTIVE EMISSION CONTROL
43517, 43528, 43530, 43531, 43548, 43549, 43557, 43573, 43587, 43593, 43596, 43604, 43612, 43624, 43637, 43649, 43653, 43662, 43671, 43675, 43681, 43683, 43685, 43689, 43692, 43693, 43695, 43701, 43702, 43704, 43710, 43713, 43715, 43716, 43717, 43718, 43720, 43721, 43722, 43725, 43726, 43729, 43730, 43731, 43733, 43734, 43736, 43738, 43739, 43741, 43742, 43745, 43746, 43747, 43749, 43751, 43809, 43818, 43972, 44049, 44053, 44073, 44089, 44100, 44127

AUTOPSY
43997

B

BACTERIA
43506, 43585, 43791

BAFFLES
43574, 43581, 43583, 43638, 43688

BAG FILTERS
43574, 43589, 43599, 43608, 43640, 43666, 44051

BALLOONS
43889

BATTERY MANUFACTURING
44009

BELGIUM
43841, 43998

BENZENES
43799, 43809, 43975

BENZO(3-4)PYRENE
43830, 43929, 43983, 43984, 43987

BENZOPYRENES
43551, 43830, 43929, 43983, 43984, 43987, 43994

BERYLLIOSIS
43998, 44001, 44006

BERYLLIUM COMPOUNDS
43533, 43998, 44001, 44006

BIO-ASSAY
43964

BIOCHEMISTRY
43789, 43999, 44006, 44027, 44037

BIOCLIMATOLOGY
43971, 44040

BIOLOGICAL FACTORS
43789, 43999, 44006, 44027, 44037

BISMUTH COMPOUNDS
43795, 43895

BLACK LIQUOR OXIDATION
43580

BLAST FURNACE AND BASIC STEEL PRODUCTS M
43571, 43753, 43800

BLAST FURNACES
43571, 43753

BLOOD CELLS
43977, 43998, 44007

BLOOD CHEMISTRY
43965, 43979, 43981, 43996, 44002, 44076

BODIES OF WATER
43515, 43536, 43543, 43545, 43833, 43836, 43851, 43884, 43891, 43898, 43995

BODY FLUIDS
44046

BOILERS
43525, 43559, 43626, 43631, 43679, 43705, 43708, 43723, 43949, 44059, 44071

BONES
43963

BREATHING
43982, 43994, 43999

BRICKS
43670

BROMIDES
43678, 43884

BROMINE COMPOUNDS
43678, 43838, 43880, 43884

BRONCHI
43983, 43984, 43993

BRONCHITIS
43970, 44002, 44005

BROWNIAN MOTION
43881

BUILDINGS
43583, 43611, 43666, 43823

BURNING
44110

BUSES
43531

BUTADIENES
43969

BUTANES
43898

BUTENES
43659

BY-PRODUCT RECOVERY
43560, 43574, 43579, 43586, 43601, 43621, 43623, 43630, 43633, 43634, 43664, 43667, 43712, 43727, 43735, 44056

C

CADMIUM COMPOUNDS
43775, 43795, 43963, 44000, 44009, 44032, 44036

CALCIUM COMPOUNDS
43670, 43838, 43934, 44056

CALCIUM SULFATES
44056

CALIBRATION METHODS
43764, 43780, 43782, 43793, 43800, 43807, 43809, 43816, 43822

CALIFORNIA
43550, 43704, 43822, 43887, 44087, 44095, 44099, 44120, 44124, 44126

CANADA
43533, 43537, 43546, 43572, 43775, 43848, 43893, 43897, 43907, 43946, 43961, 43985, 43995, 44020, 44021, 44028, 44029, 44031, 44057

CANCER
43966, 43969, 43987, 44002, 44003, 44011

CARBON
43599, 43642, 43696, 43700, 43701, 43712, 43724, 43735, 43790, 43833, 43914, 43926, 43947

CARBON BLACK
43599, 43642, 43712, 43724, 43735, 43790, 43833, 43914, 43926

CARBON DIOXIDE
43515, 43518, 43531, 43538, 43615, 43621, 43641, 43655, 43672, 43693, 43742, 43760, 43785, 43790, 43794, 43807, 43816, 43818, 43860, 43872, 43886, 43906, 43914, 43942, 43950

CARBON DISULFIDE
43924

CARBON MONOXIDE
43506, 43510, 43511, 43515, 43517, 43519, 43521, 43528, 43531, 43532, 43535, 43538, 43543, 43546, 43548, 43551, 43555, 43588, 43596, 43610, 43611, 43633, 43655, 43671, 43672, 43675, 43677, 43681, 43688, 43693, 43699, 43701, 43702, 43704, 43720, 43724, 43729, 43730, 43732, 43736, 43738, 43741, 43751, 43759, 43760, 43769, 43805, 43807, 43814, 43816, 43820, 43823, 43824, 43850, 43889, 43894, 43901, 43906, 43914, 43942, 43948, 43951, 43960, 43961, 43962, 43976, 43987, 43990, 44002, 44003, 44037, 44046, 44053, 44059, 44073, 44075, 44081, 44125, 44126, 44130, 44135, 44137

CARBOXYHEMOGLOBIN
43960, 43962, 43990

CARBURETION
44073

CARCINOGENS
43966, 43967, 43972, 43983, 43988, 43994

CARDIOVASCULAR DISEASES
43960, 44002

CASCADE IMPACTORS
43791

CATALYSIS
43527, 43585, 43601, 43612, 43624, 43632, 43634, 43655, 43659, 43660, 43681, 43890, 43949, 44102

CATALYSTS
43527, 43585, 43601, 43612, 43624, 43632, 43634, 43660, 43681, 44102

CATALYTIC ACTIVITY
43527, 43601, 43655, 43659, 43949

CATALYTIC AFTERBURNERS
43527, 43616, 43651, 43652, 43653, 43667, 43669, 43681, 43699, 43735, 43792, 43809, 43871, 43972

CATALYTIC OXIDATION
43527, 43577, 43580, 43655, 43659, 43669, 43700, 43826, 43899, 43936, 43947, 44030

CATTLE
43865, 44046

CELL GROWTH
43980

CELLS (BIOLOGY)
43971, 43977, 43994, 43998, 44007, 44008, 44046

CEMENTS
44069, 44072

CENTRAL AMERICA
43842

CENTRIFUGAL SEPARATORS
43557, 43568, 43575, 43583, 43606, 43619, 43620, 43658, 43670, 43688, 43717, 43744, 43752

CERAMICS
43512

CESIUM COMPOUNDS
43885

CHARCOAL
43696, 43700, 43701, 43947

CHEMICAL BONDS
43914, 43945

CHEMICAL COMPOSITION
43536, 43537, 43581, 43588, 43597, 43687, 43780, 43784, 43795, 43822, 43825, 43826, 43828, 43833, 43836, 43838, 43848, 43880, 43884, 43961, 44031, 44091

CHEMICAL METHODS
43627, 43757, 43759, 43761, 43762, 43773, 43781, 43814, 43822, 43824, 43904

CHEMICAL PROCESSING
43512, 43515, 43526, 43533, 43617, 43799, 43845, 43966, 44072, 44092

CHEMICALS AND ALLIED MANUFACTURING
43629, 43966, 44068

CHICAGO
43704

CHLORIDES
43509, 43884

CHLORINATED HYDROCARBONS
43515, 43789, 43798, 43799, 43808, 43815, 43843, 43966, 43980, 44015

CHLORINE
43564, 43678, 43760, 43838, 44010, 44018, 44036, 44042, 44047

CHLORINE COMPOUNDS
43509, 43880, 43884

CHLOROFORM
44015

CHLOROPLASTS
44013, 44036, 44038

CHLOROSIS
44025

CHROMATOGRAPHY
43724, 43755, 43763, 43774, 43778, 43789, 43790, 43793, 43799, 43804, 43808, 43809, 43824, 43929

CHROMIUM COMPOUNDS
43795

CILIA
44046

CLEAN AIR ACT
43972, 44064, 44072, 44093, 44133, 44135

CLOUD SEEDING
43863

CLOUDS
43856, 43863, 43880, 43916

COAL
43512, 43518, 43533, 43539, 43541, 43542, 43545, 43595, 43609, 43610, 43614, 43626, 43627, 43660, 43665, 43667, 43682, 43684, 43708, 43727, 43732, 43743, 43784, 43903, 43966, 44014, 44058, 44061, 44065, 44091, 44104, 44115, 44134

COAL CONVERSION
43540, 43567, 43576, 43579, 43591, 43682, 43698, 43727

COAL PREPARATION
43627, 43665, 43684, 44065, 44115

COATING, ENGRAVING AND ALLIED SERVICES
43646

COBALT COMPOUNDS
44036

COFFEE ROASTING
43657

COKE
43533, 43581, 43591, 43664, 43793, 43926

COLLECTORS (MECHANICAL)
43507, 43518, 43557, 43560, 43568, 43571, 43574, 43575, 43578, 43581, 43583, 43591, 43595, 43606, 43619, 43620, 43626, 43638, 43658, 43663, 43670, 43678, 43688, 43717, 43744, 43752, 43753, 43766, 43939

COLORADO
43704, 43828, 43850, 43880, 44103

COLORIMETRY
43526, 43814, 43824

COLUMN CHROMATOGRAPHY
43808

COMBUSTION
43549, 43602, 43631, 43645, 43659, 43676, 43681, 43714, 43723, 43732, 43750, 43752, 43860, 43899, 43927, 43928, 43930, 43935, 43949, 43953, 44032, 44105

COMBUSTION AIR
43513, 43553 43602, 43631, 43645, 43662, 43688, 43713, 43729, 43732, 43794, 43942

COMBUSTION PRODUCTS
43530, 43535, 43537, 43571, 43601, 43631, 43645, 43668, 43752, 43753, 43848, 43866, 43903, 43930, 43936, 43949, 44080

COMMERCIAL FIRMS
43767, 43810, 44084

COMPLIANCE (RESPIRATORY)
43994, 44004, 44072

COMPRESSION
43700

COMPUTER PROGRAMS
43516, 43711, 43734, 43889

COMPUTERS
43516, 43726, 43760, 43786, 43822, 43919

CONDENSATION
43624, 43690, 43700, 43703, 43735, 43752, 44004

CONDENSATION (ATMOSPHERIC)
43554, 43752, 43776, 43805, 43812, 43828, 43856, 43857, 43863, 43880, 43903, 43916, 43917, 43919, 43920, 44137

CONSTRUCTION MATERIALS
43670, 43949, 44069, 44072

CONTINUOUS MONITORING
43781, 43810, 43818, 43824, 43909, 43941, 44072, 44075, 44137

CONTROL AGENCIES
43685, 44123, 44133, 44135

CONTROL EQUIPMENT-GAS STREAMS
43507, 43518, 43527, 43529, 43547, 43557, 43560, 43568, 43569, 43570, 43571, 43573, 43574, 43575, 43578, 43581, 43583, 43584, 43585, 43586, 43588, 43589, 43590, 43591, 43592, 43595, 43597, 43599, 43600, 43602, 43603, 43605, 43606, 43607, 43608, 43610, 43611, 43614, 43616, 43618, 43619, 43620, 43623, 43625, 43626, 43628, 43629, 43633, 43635, 43636, 43638, 43639, 43640, 43643, 43646, 43647, 43650, 43651, 43652, 43653, 43656, 43657, 43658, 43659, 43662, 43663, 43666, 43667, 43668, 43669, 43670, 43671, 43675, 43676, 43677, 43678, 43681, 43684, 43686, 43687, 43688, 43690, 43694, 43696, 43697, 43699, 43700, 43701, 43702, 43703, 43706, 43707, 43708, 43710, 43711, 43717, 43719, 43727, 43735, 43740, 43744, 43752, 43753, 43766, 43788, 43792, 43800, 43809, 43823, 43844, 43871, 43939, 43972, 43989, 43992, 44051, 44066, 44068, 44120

CONTROL PROGRAMS
43523, 43531, 43685, 43704, 44053, 44059, 44070, 44079, 44080, 44087, 44089, 44090, 44092, 44094, 44095, 44096, 44098, 44099, 44100, 44101, 44102, 44103, 44105, 44106, 44110, 44111, 44113, 44117, 44119, 44120, 44121, 44123, 44124, 44127, 44128, 44129, 44133, 44135

CONTROLLED ATMOSPHERES
43831

COOLING
43542, 43595, 43643, 43690

COOLING TOWERS
43508, 43554, 43870

COPPER
43560, 44063, 44079, 44092, 44101

COPPER COMPOUNDS
43838, 43964, 44031, 44032, 44036

CORROSION
43949, 44026

COSTS
43528, 43539, 43540, 43541, 43542, 43547, 43548, 43572, 43576, 43581, 43589, 43594, 43609, 43626, 43665, 43670, 43673, 43682, 43684, 43686, 43698, 43700, 43701, 43702, 43706, 43707, 43715, 43718, 43725, 43728, 43731, 43735, 43741, 43749, 43752, 43767, 43869, 43974, 44049, 44050, 44051, 44053, 44054, 44055, 44056, 44057, 44059, 44060, 44061, 44062, 44077, 44082, 44107, 44114, 44124

COUNTY GOVERNMENTS
43516

CRANKCASE EMISSIONS
43517, 44073

CRANKCASE VENTILATION AIR
44073

CRITERIA
43604, 43609, 43794, 43810, 44004, 44074, 44080, 44104, 44120

CROPS
43529, 43541, 43557, 44016, 44040, 44041, 44042, 44047

CRYSTAL STRUCTURE
43566

CUMULATIVE MEASUREMENT METHODS
43765

CYANATES
43778

CYANIDES
43646, 43837

CYCLIC CRUDES AND INTERMEDIATE PRODUCTIO
43966

CYCLONES (ATMOSPHERIC)
43856

CZECHOSLOVAKIA
43553, 43581, 43929

D

DATA ANALYSIS
43516, 43794, 43822, 44081, 44108, 44112

DATA HANDLING SYSTEMS
43516, 43711, 43734, 43760, 43779, 43786, 43794, 43822, 43889, 44081, 44085, 44108, 44112, 44126, 44136

DECISIONS
44078, 44097

DECOMPOSITION
43549, 43585, 43613, 43900, 43954

DENMARK
43585

DENSITY
43627, 43871, 43873, 43887, 44121

DEPOSITION
43740, 43870, 43881, 43885, 43913, 43982, 44002, 44021, 44032

DIAGNOSIS
43964, 43989, 43997, 43998

DIESEL ENGINES
43524, 43531, 43637, 43680, 43693, 43695, 43713, 43720, 43747, 43788, 43807, 43818, 44002, 44003, 44116

DIFFUSION
43820, 43847, 43852, 43867, 43874, 43881, 43900, 43920, 43950

DIFFUSION (ATMOSPHERIC)
43528, 43534, 43839, 43853, 43866, 43870, 43886, 43888, 43892, 43894, 43896, 43951, 44081, 44091, 44108, 44134

DIFFUSION MODELS
43528, 43534, 43839, 43853, 43866, 43870, 43886, 43888, 43892, 43894, 43896, 43951, 44081, 44091, 44108, 44134

DIGESTIVE SYSTEM
43996

DIOLEFINS
43969

DISTILLATE OILS
43579, 43609, 43673, 44090

DOMESTIC HEATING
43507, 43551, 43643, 43834, 43906, 44002, 44003, 44029

DROPLETS
43801, 43802, 43826, 43870, 43881, 43908, 43943

DRYING
43529, 43588, 43595, 43616, 43619, 43620, 43629, 44022, 44065, 44067

DUST FALL
43836, 43841, 43848, 43891

DUSTS
43505, 43507, 43512, 43529, 43536, 43541, 43560, 43561, 43569, 43581, 43582, 43583, 43584, 43588, 43591, 43595, 43597, 43603, 43608, 43610, 43614, 43626, 43635, 43650, 43667, 43677, 43687, 43727, 43740, 43752, 43753, 43760, 43770, 43771, 43784, 43800, 43830, 43836, 43840, 43841, 43847, 43848, 43855, 43856, 43901, 43903, 43912, 43919, 43958, 43989, 43994, 44009, 44011, 44032, 44091, 44115, 44121, 44123

DYE MANUFACTURING
43966

DYNAMOMETERS
43532, 43683, 43742

E

ECONOMICS
43528, 43539, 43540, 43541, 43542, 43547, 43548, 43572, 43576, 43581, 43589, 43594, 43609, 43626, 43665, 43670, 43673, 43682, 43684, 43686, 43698, 43700, 43701, 43702, 43706, 43707, 43715, 43718, 43725, 43728, 43731, 43735, 43741, 43749, 43752, 43767, 43869, 43974, 44049, 44050, 44051, 44053, 44054, 44055, 44056, 44057, 44059, 44060, 44061, 44062, 44077, 44082, 44107, 44114, 44124

EDUCATION
43810

EFFICIENCY
43507, 43522, 43538, 43539, 43542, 43553, 43562, 43565, 43567, 43568, 43569, 43584, 43591, 43595, 43599, 43605, 43610, 43611, 43615, 43616, 43626, 43636, 43639, 43650, 43658, 43659, 43666, 43673, 43674, 43676, 43678, 43679, 43683, 43686, 43691, 43694, 43695, 43696, 43700, 43706, 43711, 43717, 43722, 43726, 43727, 43732, 43744, 43753, 43761, 43765, 43766, 43768, 43771, 43772, 43780, 43783, 43784, 43793, 43803, 43806, 43808, 43817, 43931, 44068, 44134

ELECTRIC BATTERIES
43726

ELECTRIC FURNACES
43589, 43603, 43635

ELECTRIC POWER GENERATION
43508, 43512, 43518, 43521, 43522, 43539, 43540, 43541, 43542, 43550, 43551, 43552, 43554, 43558, 43586, 43631, 43642, 43667, 43684, 43691, 43705, 43723, 43727, 43835, 43853, 43906, 44002, 44003, 44018, 44029, 44058, 44059, 44061, 44072, 44079, 44091, 44115, 44134, 44137

ELECTRIC POWER SOURCES
43722, 43726, 43731, 43818

ELECTRIC, GAS, AND SANITARY SERVICES
43508, 43509, 43512, 43515, 43518, 43521, 43522, 43526, 43535, 43539, 43540, 43541, 43542, 43550, 43551, 43552, 43554, 43558, 43572, 43586, 43600, 43616, 43620, 43628, 43629, 43631, 43642, 43643, 43658, 43667, 43684, 43687, 43688, 43691, 43705, 43723, 43727, 43735, 43811, 43835, 43845, 43853, 43865, 43906, 44002, 44003, 44018, 44029, 44049, 44056, 44058, 44059, 44061, 44067, 44072, 44079, 44081, 44091, 44115, 44123, 44134, 44135, 44137

ELECTRICAL AND ELECTRONIC EQUIPMENT PLAN
44009

ELECTRICAL MEASUREMENT DEVICES
43692

ELECTRICAL PROPERTIES
43584, 43597, 43625, 43627, 43650, 43740, 43759, 43800, 43939, 44015

ELECTRICAL RESISTANCE
43584, 43597, 43800

ELECTROCHEMICAL METHODS
43627, 43757, 43759, 43762, 43781, 43814

ELECTROCONDUCTIVITY ANALYZERS
43765, 43823

ELECTROLYSIS
43621

ELECTRON MICROSCOPY
43766, 44026

ELECTROSTATIC PRECIPITATORS
43529, 43560, 43574, 43584, 43592, 43595, 43597, 43605, 43610, 43625, 43626, 43636, 43638, 43650, 43659, 43663, 43688, 43744, 43752, 43800, 44051, 44066

EMISSION INVENTORIES
43505, 43528, 43533, 43535, 44128, 44134

EMISSION STANDARDS
43517, 43521, 43546, 43547, 43657, 43715, 43741, 43751, 43785, 43788, 43818, 43972, 44053, 44061, 44063, 44065, 44066, 44067, 44068, 44069, 44071, 44072, 44073, 44079, 44080, 44083, 44087, 44093, 44095, 44098, 44099, 44101, 44104, 44105, 44106, 44111, 44113, 44115, 44116, 44117, 44119, 44123, 44124, 44134, 44135

EMISSIVITY
43806

EMPHYSEMA
43993, 44002

ENFORCEMENT PROCEDURES
44012, 44091, 44093, 44097, 44109, 44121, 44130, 44131, 44132

ENGINE DESIGN MODIFICATION
43587, 43596, 43671, 43689, 43715, 43716, 43718, 43720, 43721, 43722, 43726, 43729, 43730, 43731, 43733, 43734, 43736, 43738, 43741, 43745, 43746, 43747, 43749, 43818, 44073

ENGINE EMISSIONS
43507, 43510, 43511, 43513, 43514, 43517, 43519, 43522, 43524, 43527, 43528, 43531, 43532, 43543, 43546, 43547, 43548, 43549, 43550, 43551, 43555, 43570, 43573, 43587, 43593, 43596, 43602, 43604, 43609, 43612, 43624, 43637, 43649, 43651, 43652, 43653, 43662, 43669, 43671, 43675, 43681, 43683, 43685, 43686, 43689, 43690, 43692, 43693, 43694, 43695, 43696, 43697, 43700, 43701, 43702, 43703, 43704, 43706, 43707, 43710, 43713, 43715, 43717, 43718, 43720, 43721, 43722, 43724, 43725, 43729, 43730, 43734, 43736, 43738, 43739, 43742, 43745, 43746, 43747, 43749, 43751, 43788, 43792, 43807, 43809, 43814, 43818, 43820, 43827, 43828, 43840, 43866, 43894, 43896, 43903, 43905, 43908, 43942, 43948, 43972, 43976, 43985, 43988, 43996, 44002, 44003, 44032, 44052, 44053, 44054, 44057, 44059, 44073, 44075, 44076, 44093, 44100, 44116, 44120, 44124, 44125

ENGINE OPERATING CYCLES
43514, 43519, 43532, 43587, 43604, 43662, 43685, 43718, 43722, 43726, 43741, 44073

ENGINE OPERATION MODIFICATION
43530, 43549, 43557, 43593, 43596, 43637, 43675, 43689, 43692, 43693, 43695, 43713, 43717, 43718, 43720, 43729, 43736, 43738, 43746, 43747, 44073, 44100

ENGINES
43513, 43521, 43524, 43531, 43543, 43549, 43555, 43587, 43593, 43596, 43602, 43612, 43624, 43637, 43642, 43649, 43653, 43669, 43671, 43675, 43680, 43683, 43689, 43693, 43695, 43713, 43714, 43715, 43716, 43718, 43720, 43721, 43727, 43729, 43730, 43733, 43734, 43737, 43738, 43741, 43742, 43745, 43746, 43747, 43749, 43788, 43807, 43818, 43935, 44002, 44003, 44073, 44116

ENZYMES
43965, 44030, 44044

EPIDEMIOLOGY
43840, 43963, 43966, 43974, 43986, 43991, 44000

EQUIPMENT CRITERIA
43810

ESTERS
43577, 43789

ETHERS
43577, 43789, 43938, 43966, 44015

ETHYL ALCOHOL
43604, 43790, 43831

ETHYLENE
43506, 43809, 44036, 44042, 44047

EUROPE
43507, 43508, 43512, 43513, 43515, 43518, 43521, 43522, 43523, 43525, 43528, 43529, 43544, 43551, 43553, 43554, 43555, 43559, 43560, 43562, 43564, 43567, 43569, 43571, 43579, 43581, 43582, 43584, 43585, 43587, 43588, 43589, 43592, 43596, 43599, 43610, 43613, 43615, 43616, 43630, 43633, 43634, 43635, 43636, 43644, 43645, 43646, 43647, 43654, 43656, 43657, 43667, 43668, 43670, 43674, 43677, 43699, 43736, 43743, 43755, 43758, 43760, 43762, 43764, 43774, 43778, 43784, 43790, 43791, 43800, 43806, 43812, 43813, 43814, 43817, 43826, 43829, 43830, 43831, 43835, 43836, 43840, 43841, 43842, 43858, 43859, 43861, 43862, 43863, 43864, 43869, 43871, 43877, 43881, 43899, 43901, 43903, 43916, 43921, 43924, 43926, 43927, 43928, 43929, 43932, 43935, 43938, 43942, 43943, 43949, 43950, 43953, 43962, 43964, 43965, 43970, 43971, 43973, 43976, 43977, 43980, 43986, 43988, 43994, 43997, 43998, 44001, 44006, 44007, 44008, 44009, 44010, 44012, 44014, 44016, 44018, 44019, 44026, 44027, 44029, 44035, 44039, 44043, 44045, 44048, 44051, 44053, 44054, 44055, 44058, 44071, 44085, 44091, 44115, 44118, 44122, 44128, 44130, 44132

EXCESS AIR
43513, 43645, 43732, 43794, 43942

EXCRETIONS
43761, 43979, 43981, 43996, 44000

EXHAUST SYSTEMS
43588, 43589, 43628, 43643, 43678, 43687, 43703

EXPERIMENTAL EQUIPMENT
43665, 43921, 43939, 43982, 43984

EXPERIMENTAL METHODS
43852, 43984, 44043

EXPLOSIONS
43595, 43773, 43883

EXPOSURE CHAMBERS
44040, 44041

EXPOSURE METHODS
43975, 43983, 43984, 44040, 44041, 44043

EXTERNAL COMBUSTION ENGINES
43689, 43715, 43716, 43720, 43721, 43729, 43730, 43733, 43734, 43737, 43738, 43818

EYE IRRITATION
43957, 43978

F

FABRIC FILTERS
43574, 43589, 43599, 43608, 43640, 43666, 44051

FANS (BLOWERS)
43628, 43678, 43703

FARMS
43526, 43529, 43544, 43551, 43658, 43865, 44012, 44014, 44021, 44032

FAT AND OIL PRODUCTION
44083

FEASIBILITY STUDIES
43609, 43626, 43684, 43731, 43769

FEEDLOTS
44032

FERROALLOYS
43753, 44051

FIELD TESTS
43582, 43717, 43785, 43794, 43845, 44025

FILTER FABRICS
43569, 43573, 43599, 43610, 43614, 43626, 43670, 43688, 43740, 43788, 43823, 44051, 44066

FILTERS
43568, 43569, 43573, 43574, 43583, 43589, 43590, 43599, 43607, 43608, 43610, 43611, 43614, 43626, 43639, 43640, 43643, 43656, 43666, 43670, 43688, 43727, 43740, 43744, 43752, 43788, 43823, 43844, 44051, 44066

FINLAND
43613

FIRING METHODS
43513, 43525, 43553, 43602, 43604, 43631, 43645, 43649, 43662, 43675, 43683, 43688, 43713, 43723, 43729, 43732, 43750, 43794, 43942

FLAME AFTERBURNERS
43602, 43657, 43662, 43667, 43671, 43675, 43717, 43735, 43871

FLAME IONIZATION DETECTOR (CO)
43804, 43809, 43824

FLARES
43677

FLUID FLOW
43568, 43597, 43618, 43660, 43705, 43732, 43733, 43744, 43759, 43852, 43870, 43921, 43956, 43959

FLUORESCENCE
43762, 43769, 43911, 43914

FLUORIDES
43606, 43608, 43968, 43995, 44025, 44036, 44042, 44047, 44066, 44068, 44074, 44111

FLUORINATED HYDROCARBONS
43967

FLUORINE
44014, 44074

FLUORINE COMPOUNDS
43512, 43606, 43608, 43670, 43968, 43995, 44025, 44036, 44042, 44045, 44046, 44047, 44066, 44068, 44074, 44111, 44139

FLUOROSIS
43995

FLY ASH
43518, 43581, 43687, 43688, 43708, 43752, 43923, 44091, 44123

FOG
43554, 43776, 43863, 43917, 43920

FOOD AND KINDRED PRODUCTS INDUSTRY
43512, 43529, 43544, 43551, 43557, 43620, 43638, 43657, 43865, 44012, 44014, 44021, 44083

FORESTS
43851, 43898, 44014, 44018, 44091, 44139

FORMALDEHYDES
43904, 43938, 43951, 43957, 44004

FRANCE
43584, 43599, 43635, 43645, 43677, 43764, 43858, 43877, 43921, 43926, 43935, 43962, 43973, 43977, 44001, 44085

FREE RADICALS
43890, 43893, 43928, 43951

FUEL ADDITIVES
43548, 43555, 43563, 43642, 43680, 43972, 44097

FUEL CHARACTERISTICS
43665, 43698

FUEL CHARGING
43675, 43729

FUEL CRITERIA
43604, 43609

FUEL EVAPORATION
43517, 43519, 43547, 43570, 43686, 43690, 43694, 43696, 43697, 43700, 43701, 43702, 43703, 43706, 43707, 43710, 44120, 44124

FUEL GASES
43512, 43513, 43521, 43539, 43542, 43550, 43551, 43552, 43553, 43579, 43594, 43615, 43649, 43664, 43667, 43683, 43684, 43723, 43727, 44018, 44058

FUEL OIL PREPARATION
43523, 43579, 43632, 43660, 43673, 43684

FUEL OILS
43533, 43539, 43542, 43545, 43550, 43552, 43579, 43609, 43632, 43660, 43663, 43673, 43732, 43949, 44042, 44055, 44058, 44090

FUEL RESOURCES
43609

FUEL STANDARDS
43707, 44080, 44090, 44097

FUEL TANK EVAPORATION
43570, 43710

FUEL TREATMENT
43523, 43540, 43567, 43576, 43579, 43591, 43627, 43632, 43655, 43660, 43665, 43673, 43682, 43684, 43698, 43727, 43743, 44065, 44115

FUMES
43561, 43583, 43588, 43589, 43753, 44123

FUNGI
43506, 43989, 44036

FURNACES
43525, 43537, 43553, 43563, 43579, 43588, 43589, 43603, 43619, 43620, 43635, 43712, 43727, 43732, 43750, 43823, 44071

G

GAS CHROMATOGRAPHY
43724, 43755, 43763, 43774, 43789, 43790, 43793, 43799, 43804, 43808, 43809, 43824

GAS SAMPLING
43764, 43770, 43796

GAS TURBINE ENGINES
43521, 43642, 43715, 43718, 43720, 43727, 43741, 43745, 43746, 43749, 43818

GASIFICATION
43540, 43567, 43576, 43579, 43591, 43682, 43698, 43727

GASOLINES
43513, 43523, 43531, 43533, 43555, 43604, 43609, 43649, 43707, 43710, 43725, 43742, 43972, 43975, 43985, 44002, 44003, 44059, 44120

GENETICS
43967, 44007, 44014

GEORGIA
44106

GERMANY, FEDERAL REPUBLIC
43507, 43508, 43512, 43513, 43515, 43518, 43521, 43522, 43528, 43529, 43571, 43592, 43596, 43636, 43646, 43647, 43654, 43657, 43667, 43668, 43670, 43755, 43758, 43760, 43778, 43791, 43813, 43829, 43830, 43835, 43842, 43859, 43863, 43871, 43938, 43942, 43950, 43976, 43994, 44012, 44014, 44018, 44027, 44043, 44048, 44051, 44053, 44054, 44071, 44091, 44115, 44118, 44128

GLANDS
43965

GLASS
43512, 43562, 43608

GLASS FABRICS
43614, 43823

GRAIN PROCESSING
43557

GRAPHITE
43724, 43936

GRAVITY COLLECTORS
43574, 43581, 43583, 43638, 43688, 43752

GREAT BRITAIN
43525, 43555, 43569, 43579, 43582, 43587, 43589, 43630, 43634, 43656, 43762, 43784, 43800, 43806, 43817, 43836, 43840, 43842, 43858, 43899, 43916, 43927, 43928, 43970, 43971, 43997, 44029, 44035, 44039, 44055, 44058

GROUND LEVEL
43529, 43559, 43829, 43835, 43853, 43868, 43886, 43889, 43900, 44012, 44014, 44018, 44091

GUINEA PIGS
43963, 44011

H

HALOGEN GASES
43555, 43564, 43678, 43760, 43838, 44010, 44014, 44018, 44036, 44042, 44047, 44074

HALOGENATED HYDROCARBONS
43515, 43789, 43798, 43799, 43808, 43815, 43843, 43966, 43967, 43980, 44015

HAMSTERS
43983

HAWAII
43846

HAYFEVER
43991

HAZE
43805, 43828, 43919, 44137

HEALTH IMPAIRMENT
43506, 43539, 43541, 43548, 43840, 43968, 43972, 43974, 43979, 43987, 43990, 43993, 43995, 43996, 44002, 44004, 44005, 44010, 44046, 44076

HEALTH STATISTICS
43960, 43966, 43971

HEAT OF COMBUSTION
43592

HEAT TRANSFER
43508, 43525, 43542, 43585, 43587, 43595, 43643, 43660, 43671, 43690, 43697, 43733, 43882, 43886, 43953

HEAVY-DUTY VEHICLES
43528, 43531, 43686, 44073, 44116

HEIGHT FINDING
43776, 43839, 43866

HEMATOLOGY
43960, 43962, 43965, 43979, 43981, 43990, 43996, 44002, 44046, 44076

HEMOGLOBIN
43990, 44046

HERBICIDES
43617, 44032

HEXANES
43942

HI-VOL SAMPLERS
43808, 43824

HIGHWAYS
43510, 43726, 43896, 44125

HORMONES
43966

HUMIDITY
43565, 43582, 43643, 43800, 43805, 43822, 43868, 43878, 43891, 43899, 43903, 43911, 43917, 43922, 44022, 44034

HYDROCHLORIC ACID
43509, 43515, 43646, 43678, 43760, 44036, 44042, 44047

HYDRODESULFURIZATION
43632, 43660, 43673

HYDROFLUORIC ACID
43534, 43562, 43630, 43646, 43760, 43965, 44014, 44044

HYDROGEN
43538, 43594, 43655, 43683, 43725, 43728, 43739, 43742, 43748, 43826, 43873, 43942, 43951, 44062

HYDROGEN SULFIDE
43506, 43512, 43526, 43567, 43580, 43615, 43621, 43634, 43648, 43659, 43664, 43672, 43674, 43727, 43732, 43760, 43790, 43805, 43824, 43832, 43844, 43851, 43917, 43938, 44083, 44102

HYDROSPHERE
43833, 43836

HYDROXIDES
43893

HYGROSCOPICITY
43875, 43880, 43916

HYPERSENSITIVITY
43989

I

ICE
43554, 43880, 43920

ILLINOIS
43704, 43844

IMMUNOLOGY
43989, 43992, 43998

IMPINGEMENT
43824

INCINERATORS (REFUSE)
43509, 43515, 43600, 43616, 43620, 43658, 43687, 43688, 43735, 44002, 44003, 44067, 44072

INCINERATORS (WASTE GASES)
43527, 43602, 43616, 43633, 43651, 43652, 43653, 43657, 43659, 43662, 43667, 43668, 43669, 43671, 43675, 43676, 43681, 43699, 43717, 43735, 43792, 43809, 43871, 43972

INDOOR
43585, 43610, 43777, 43778, 43823, 44073

INDUSTRIAL AREAS
43829, 43843, 43845, 43918, 43977, 43981, 44038, 44045, 44052, 44122

INFECTIOUS DISEASES
43974, 43999

INFRARED RADIATION
43806, 43912, 43915

INFRARED SPECTROMETRY
43695, 43772, 43784, 43788, 43792, 43799, 43817, 43823, 43824, 43858, 43889, 43912, 43914, 43940

INGESTION
43996

INORGANIC ACIDS
43509, 43515, 43527, 43534, 43537, 43562, 43623, 43630, 43646, 43678, 43760, 43792, 43873, 43890, 43903, 43917, 43918, 43947, 43952, 43965, 43972, 44014, 44036, 44042, 44044, 44047, 44056, 44068, 44072, 44092

INSPECTION
43517, 43548, 43704, 43713, 43818, 44100

INSTRUMENTATION
43791, 43803, 43806, 43807, 43810, 43817, 43822, 43823, 43850, 43889, 43910, 43955

INTERNAL COMBUSTION ENGINES
43513, 43524, 43531, 43543, 43549, 43555, 43587, 43593, 43596, 43602, 43612, 43624, 43637, 43649, 43653, 43669, 43671, 43675, 43680, 43683, 43693, 43695, 43713, 43714, 43715, 43718, 43720, 43734, 43742, 43747, 43788, 43807, 43818, 43935, 44002, 44003, 44073, 44116

INVERSION
43551, 43772, 43776, 43850, 43865, 43876, 43900, 43905

IODIMETRIC METHODS
43824, 43904

IONIZATION
43650

IONS
43506, 43826, 43854, 43879, 43934, 43939

IRELAND
43842, 43924, 43964

IRON
43520, 43553, 43582, 43635, 43677

IRON COMPOUNDS
43795, 43848, 43945, 44031, 44032, 44036

IRRADIATION CHAMBERS
43948, 43957

ISOPENTANES
43809

ISOTOPES
43811, 43895, 43913

ITALY
43633, 43812, 43842, 43869, 44008

J

JAPAN
43520, 43526, 43532, 43565, 43566, 43593, 43598, 43601, 43602, 43603, 43604, 43605, 43606, 43608, 43611, 43623, 43625, 43628, 43629, 43631, 43637, 43648, 43650, 43655, 43659, 43660, 43661, 43662, 43666, 43672, 43673, 43676, 43678, 43679, 43692, 43709, 43756, 43765, 43770, 43771, 43772, 43773, 43776, 43777, 43779, 43786, 43787, 43788, 43795, 43796, 43797, 43798, 43799, 43801, 43802, 43808, 43834, 43837, 43839, 43842, 43843, 43854, 43857, 43860, 43866, 43867, 43868, 43873, 43874, 43876, 43878, 43879, 43882, 43902, 43930, 43937, 43941, 43944, 43947, 43954, 43968, 43975, 43979, 43981, 43989, 43991, 43992, 44000, 44017, 44024, 44040, 44041, 44080, 44083, 44084, 44088, 44109, 44136, 44138

JET AIRCRAFT
43514, 43538, 43748, 43858, 43873, 43883, 43890, 43893

K

KANAGAWA PREFECTURE
44109

KANSAS
44098, 44113

KENTUCKY
44119, 44134

KETONES
43577, 43659, 43719, 43831, 43898, 43939

KIDNEYS
44000, 44008

KILNS
43586, 43670

KRAFT (SULFATE) PULPING
43580, 43613

L

LABORATORY ANIMALS
43972, 43974, 44007, 44011

LAKES
43851

LAND USE PLANNING
43539, 44021, 44052, 44086, 44121, 44127, 44129

LANDFILLS
43845

LASERS
43756, 43787, 43792, 43797, 43802, 43813, 43910, 43912, 43914, 43946

LATIN AMERICA
43842, 43847, 43851

LEAD
44063

LEAD COMPOUNDS
43512, 43528, 43533, 43548, 43555, 43707, 43717, 43795, 43830, 43838, 43880, 43895, 43963, 43964, 43972, 43975, 43976, 43979, 43981, 43985, 44032, 44036, 44046, 44076

LEAVES
44016, 44026, 44027, 44040, 44041, 44044

LEGISLATION
43558, 43572, 43574, 43972, 44064, 44071, 44072, 44078, 44086, 44093, 44127, 44128, 44132, 44133, 44135

LETTUCE
44031, 44042

LEUKEMIA
43969

LEUKOCYTES
44007

LIDAR
43772, 43776, 43779, 43797, 43801, 43813, 43822, 43854, 43855, 43857, 43867, 43879, 43911, 43914

LIGHT SCATTERING
43772, 43777, 43783, 43801, 43806, 43846, 43849, 43854, 43857, 43879, 43880, 43887, 43909, 43910, 43911, 43914, 43915

LIGHT-DUTY VEHICLES
43507, 43519, 43527, 43528, [illegible], 43546, 43550, 43551, 43604, 43609, 43651, 43681, 43686, 43692, 43701, 43702, 43717, 43724, 43751, 43792, 43820, 43908, 43942, 43972, 43976, 43985, 44002, 44003, 44053, 44054, 44057

LIME KILNS
43586

LIMESTONE
43586, 43684, 43727, 43732, 44056

LINE SOURCES
43852

LIPIDS
43789, 43954, 44002

LITIGATION
44131

LONDON
43971, 43997

LOS ANGELES
43704, 43822

LOWER ATMOSPHERE
43806, 43832, 43847, 43857, 43858, 43859, 43861, 43864, 43882, 43884, 43885, 43887, 43888, 43889, 43893, 43895, 43910, 43912, 43913, 43918, 43951, 43952

LUBRICANTS
43636

LUNG CANCER
43987, 44002, 44003, 44011

LUNG CLEARANCE
43983, 43999

LUNGS
43950, 43954, 43965, 43974, 43982, 43984, 43993, 43994, 43997, 43999, 44002, 44003, 44006

LYMPHOCYTES
43977, 43998

M

MAGNESIUM COMPOUNDS
43795, 43838

MAGNETIC PROPERTIES
43743, 43945

MAGNETIC SEPARATION
43665

MAINTENANCE
43517, 43569, 43589, 43595, 43597, 43599, 43607, 43608, 43639, 43640, 43687, 43688, 43704, 43713, 43718, 43735, 43800, 44073, 44100

MANGANESE COMPOUNDS
43563, 43642, 43848, 43884, 43937, 43972, 44032

MANUFACTURING INDUSTRIES
43512, 43529, 43544, 43551, 43557, 43561, 43567, 43571, 43572, 43579, 43580, 43588, 43599, 43613, 43620, 43629, 43633, 43638, 43646, 43657, 43660, 43753, 43800, 43865, 43966, 44009, 44012, 44014, 44021, 44035, 44068, 44078, 44083

MAPPING
43552, 43812, 44019, 44021, 44028, 44034, 44039, 44091

MASS SPECTROMETRY
43755, 43762, 43789

MASS TRANSPORTATION
43704, 44049, 44052, 44127

MATHEMATICAL ANALYSES
43510, 43511, 43516, 43517, 43530, 43531, 43557, 43665, 43711, 43714, 43734, 43740, 43744, 43759, 43766, 43800, 43801, 43802, 43835, 43840, 43848, 43849, 43862, 43864, 43872, 43873, 43874, 43875, 43876, 43881, 43882, 43883, 43885, 43886, 43887, 43888, 43895, 43906, 43919, 43921, 43928, 43930, 43931, 43932, 43933, 43935, 43940, 43942, 43951, 43956, 43959, 44017, 44052, 44077, 44081, 44082, 44107, 44108, 44118, 44126

MATHEMATICAL MODELING
43510, 43511, 43516, 43517, 43531, 43557, 43665, 43711, 43714, 43740, 43744, 43835, 43840, 43848, 43849, 43872, 43873, 43875, 43883, 43887, 43888, 43895, 43906, 43919, 43928, 43931, 43935, 43940, 43951, 43956, 44077, 44081, 44107, 44108, 44118, 44126

MAXIMUM ALLOWABLE CONCENTRATION
43965, 43969, 44080

MEMBRANE FILTRATION
43784, 43795

MERCAPTANS
43580, 43659, 43938

MERCURY COMPOUNDS
43533, 43544, 43644, 43769, 43789, 43838, 43845, 43891, 43964, 44067

METABOLISM
43551, 43981, 43987, 43988, 43994, 44006, 44023, 44030, 44044

METAL COMPOUNDS
43512, 43528, 43533, 43541, 43544, 43548, 43555, 43563, 43580, 43642, 43644, 43670, 43680, 43707, 43717, 43769, 43775, 43780, 43789, 43795, 43830, 43838, 43845, 43848, 43855, 43880, 43884, 43885, 43891, 43895, 43934, 43937, 43945, 43963, 43964, 43972, 43975, 43976, 43978, 43979, 43981, 43985, 43988, 43998, 44000, 44001, 44006, 44008, 44009, 44025, 44031, 44032, 44036 44046, 44056, 44067, 44076, 44130

METAL FABRICATION
43512, 43561, 43588, 43633, 43646

METAL INDUSTRIES
43571, 43753, 43800

METAL POISONING
43964, 43978, 43985, 43988, 43996, 43998, 44000, 44001, 44006, 44008, 44009, 44046

METALS
43520, 43553, 43560, 43582, 43635, 43655, 43677, 43753, 43899, 43925, 44051, 44063, 44066, 44079, 44092, 44101, 44111

METEOROLOGICAL INSTRUMENTS
43853, 43889

METEOROLOGY
43506, 43528, 43534, 43536, 43543, 43544, 43545, 43550, 43554, 43559, 43565, 43582, 43643, 43752, 43760, 43776, 43800, 43805, 43806, 43812, 43819, 43822, 43827, 43828, 43832, 43835, 43836, 43839, 43840, 43841, 43842, 43850, 43851, 43852, 43854, 43856, 43857, 43860, 43863, 43864, 43865, 43866, 43868, 43872, 43873, 43874, 43875, 43876, 43877, 43878, 43880, 43881, 43882, 43886, 43891, 43892, 43896, 43897, 43898, 43899, 43901, 43902, 43903, 43905, 43907, 43910, 43911, 43915, 43916, 43917, 43919, 43920, 43922, 43951, 43968, 44022, 44029, 44031, 44034, 44039, 44125, 44128, 44134, 44137

METHANES
43506, 43688, 43699, 43805, 43807, 43809, 43816, 43951

METROPOLITAN AREAS
43509, 43512, 43517, 43519, 43528, 43534, 43537, 43541, 43543, 43548, 43550, 43552, 43704, 43726, 43805, 43812, 43820, 43824, 43828, 43830, 43837, 43838, 43840, 43850, 43852, 43866, 43880, 43886, 43887, 43892, 43894, 43897, 43899, 43901, 43902, 43907, 43915, 43916, 43919, 43941, 43961, 43970, 43976, 43986, 43987, 43996, 44002, 44005, 44021, 44022, 44023, 44033, 44035, 44039, 44053, 44054, 44070, 44075, 44076, 44118, 44122, 44129, 44136

MICE
43984, 43988, 44007, 44011

MICROMETEOROLOGY
43896, 43897, 43899, 43916, 43968, 44022, 44029

MICROORGANISMS
43506, 43585, 43610 43614, 43791, 43989, 44036

MICROSCOPY
43762

MIDDLE ATMOSPHERE
43854, 43858, 43873, 43879, 43883, 43887, 43889, 43890, 43893, 43895, 43905

MINERAL PROCESSING
43512, 43582, 43595, 44069, 44104

MINING
43533, 43539, 43541, 43667, 43784, 43964, 43966, 44032

MINNESOTA
43822, 44089

MISSOURI
43838, 43844, 43892

MISTS
43583, 43636, 43663, 43678, 43917, 43918, 44042

MOBILE EMISSION SOURCES
43507, 43510, 43514, 43517, 43519, 43522, 43527, 43528, 43531, 43532, 43535, 43538, 43546, 43548, 43550, 43551, 43570, 43582, 43604, 43609, 43651, 43652, 43656, 43662, 43680, 43681, 43685, 43686, 43692, 43701, 43702, 43704, 43717, 43724, 43745, 43748, 43751, 43792, 43803, 43814, 43820, 43827, 43828, 43840, 43850, 43858, 43873, 43883, 43885, 43890, 43893, 43894, 43896, 43905, 43906, 43908, 43942, 43972, 43976, 43985, 43996, 44002, 44003, 44049, 44052, 44053, 44054, 44057, 44059, 44073, 44075, 44076, 44081, 44082, 44089, 44093, 44100, 44116, 44120, 44121, 44125, 44127, 44129

MOLYBDENUM COMPOUNDS
43795

MONITORING
43512, 43529, 43530, 43693, 43760, 43767, 43770, 43771, 43772, 43781, 43786, 43796, 43800, 43803, 43805, 43806, 43810, 43814, 43817, 43818, 43820, 43824, 43835, 43909, 43910, 43911, 43912, 43941, 44063, 44065, 44066, 44072, 44075, 44079, 44088, 44111, 44122, 44136, 44137

MONTHLY
43765, 43941

MORBIDITY
43975, 43987

MORTALITY
43960, 43975, 43980, 44002, 44003, 44032

MOUNTAINS
43898

MUTAGENESIS
43967, 44007

N

NATIONAL GOVERNMENTS
44050, 44078, 44080, 44123, 44130

NATURAL EMISSION SOURCES
43536, 43545

NATURAL GAS
43521, 43550, 43551, 43579, 43615, 43723, 44018, 44058

NECROSIS
44044

NERVOUS SYSTEM
43965, 43975, 43985, 43996, 44002, 44003, 44046

NETHERLANDS
43523, 43551, 43554, 43736, 43774, 43814, 43901, 43986, 44122, 44132

NEUTRON ACTIVATION ANALYSIS
43762, 43775, 43811, 43838, 43929

NEVADA
44070, 44079, 44101

NEW JERSEY
43827, 44042, 44100, 44102

NEW MEXICO
43832

NEW YORK CITY
43509, 43704, 44090

NEW YORK STATE
43509, 43511, 43704, 43827, 44081, 44090, 44102

NICKEL COMPOUNDS
43795, 43988, 44031, 44032, 44036

NITRATES
43506, 43527, 43551, 43822, 43908, 43952, 43957, 44036, 44042, 44044, 44047, 44139

NITRIC ACID
43527, 43873, 43890, 43952, 44072

NITRIC ANHYDRIDE (N2O5)
43873

NITRIC OXIDE (NO)
43513, 43528, 43549, 43563, 43601, 43645, 43655, 43720, 43723, 43724, 43732, 43751, 43760, 43764, 43769, 43805, 43807, 43816, 43822, 43846, 43853, 43858, 43890, 43893, 43927, 43928, 43930, 43934, 43935, 43945, 43948, 43952, 43953, 43957, 43976, 43993

NITRILES
43952, 43969

NITRITES
43937

NITROGEN
43631, 43865, 43914, 43927, 43935, 43940, 43942, 43952

NITROGEN DIOXIDE (NO2)
43506, 43521, 43525, 43531, 43564, 43601, 43645, 43720, 43757, 43760, 43764, 43769, 43773, 43797, 43805, 43807, 43814, 43816, 43822, 43844, 43853, 43858, 43866, 43890, 43922, 43930, 43934, 43948, 43952, 43957, 43976, 43993, 44017, 44024, 44044, 44047, 44059, 44135, 44137

NITROGEN ORGANIC COMPOUNDS
43577, 43659, 43789, 43944, 43966, 43969, 44030, 44083

NITROGEN OXIDES
43506, 43510, 43511, 43512, 43513, 43515, 43517, 43519, 43521, 43525, 43528, 43531, 43532, 43535, 43538, 43546, 43549, 43550, 43551, 43555, 43557, 43563, 43564, 43593, 43596, 43601, 43604, 43611, 43612, 43624, 43631, 43637, 43645, 43654, 43655, 43675, 43679, 43681, 43683, 43688, 43693, 43695, 43701, 43702, 43704, 43720, 43723, 43724, 43727, 43729, 43730, 43732, 43736, 43738, 43739, 43741, 43746, 43751, 43757, 43760, 43764, 43769, 43773, 43797, 43805, 43807, 43814, 43816, 43822, 43824, 43844, 43846, 43850, 43853, 43858, 43866, 43873, 43887, 43890, 43893, 43917, 43918, 43922, 43927, 43928, 43930, 43934, 43935, 43937, 43942, 43945, 43948, 43952, 43953, 43957, 43961, 43976, 43993, 44002, 44003, 44017, 44021, 44024, 44036, 44044, 44046, 44047, 44053, 44059, 44081, 44126, 44135, 44137

NITROGEN TRIOXIDE (NO3)
43934

NITROUS ACID
43890, 43952

NITROUS OXIDE (N2O)
43952

NON-METROPOLITAN AREAS
43517, 43526, 43529, 43543, 43544, 43551, 43658, 43830, 43836, 43844, 43845, 43865, 43892, 43898, 43899, 43900, 43964, 43977, 43986, 43987, 44012, 44014, 44021, 44022, 44032

NORWAY
44010

NUCLEAR EXPLOSIONS
43883

NUCLEAR POWER PLANTS
43539, 43540, 43541, 43542, 44058

NUCLEATION
43880, 43903

O

OCEANS
43515, 43536, 43543, 43545, 43833, 43836, 43884, 43891, 43898, 43995

OCTANES
43809

ODOR CONTROL
43580, 43585, 43598, 43613, 43617, 43620, 43628, 43629, 43633, 43648, 43657, 43659, 43667, 43668, 43676, 43678, 43687, 43688, 43735, 43750

ODOR COUNTERACTION
43580, 43585, 43598, 43613, 43617, 43620, 43628, 43629, 43633, 43648, 43657, 43659, 43667, 43668, 43676, 43678, 43687, 43688, 43735, 43750

ODORIMETRY
43763, 43799

ODOROUS POLLUTANTS
43512, 43513, 43556, 43585, 43613, 43617, 43620, 43628, 43629, 43633, 43648, 43657, 43659, 43667, 43676, 43687, 43688, 43693, 43750, 43763, 43799, 43871, 43973, 44002, 44068, 44083

OIL BURNERS
43525, 43537, 43563

OLEFINS
43506, 43659, 43799, 43809, 43927, 43969, 44036, 44042, 44047

OPEN BURNING
44110

OPERATING CRITERIA
44104, 44120

OPERATING VARIABLES
43514, 43525, 43530, 43549, 43637, 43645, 43705, 43714, 43715, 43726, 43730, 43735, 43747, 43949

OPTICAL METHODS
43762

OREGON
44111

ORGANIC ACIDS
43509, 43577, 43657, 43659, 43798, 43929, 44015

ORGANIC WASTES
43526, 43865

ORGANOMETALLICS
43789

ORSAT ANALYSIS
43785

OSAKA
43902, 43968

OXIDANTS
43760, 43805, 43837, 43874, 43878, 43901, 43902, 43957, 43961, 43968, 43976, 43999, 44047, 44059, 44068, 44070, 44100, 44130, 44135, 44137

OXIDATION
43543, 43580, 43602, 43659, 43662, 43671, 43675, 43719, 43759, 43893, 43903, 43917, 43918, 43937, 44020

OXYGEN
43580, 43724, 43725, 43807, 43816, 43873, 43914, 43924, 43927, 43935, 43938, 43940, 43942

OZONE
43551, 43756, 43760, 43803, 43816, 43822, 43824, 43827, 43849, 43850, 43853, 43854, 43858, 43873, 43883, 43887, 43890, 43900, 43904, 43908, 43912, 43940, 43954, 43961, 43968, 44013, 44015, 44017, 44021, 44024, 44036, 44040, 44041, 44042, 44044, 44047, 44048

P

PAPER AND ALLIED MANUFACTURING
43580, 43613, 44078

PAPER MILLS
44078

PARTICLE COUNTING
43782, 43783, 43822

PARTICLE GROWTH
43857, 43880, 43903, 43908

PARTICLE INVESTIGATION METHODS
43782, 43783, 43784, 43791, 43795, 43822, 43824, 43842, 43910

PARTICLE SEPARATION
43784, 43795, 43824

PARTICLE SIZE
43507, 43581, 43597, 43614, 43625, 43711, 43744, 43752, 43754, 43766, 43768, 43771, 43782, 43783, 43801, 43802, 43822, 43828, 43847, 43850, 43854, 43857, 43870, 43875, 43879, 43880, 43887, 43908, 43931, 43946, 43955, 43958, 43961, 43985, 43994, 44004

PARTICULATE SAMPLING
43754, 43766, 43770, 43771, 43784, 43791, 43800, 43822, 43931, 43991

PATHOLOGICAL TECHNIQUES
43983, 43997, 44008

PENNSYLVANIA
43519, 43552, 44094

PENTANES
43809, 43898

PERFORMANCE STANDARDS
43517, 43521, 43546, 43547, 43657, 43715, 43741, 43751, 43785, 43788, 43818, 43972, 44053, 44061, 44063, 44065, 44066, 44067, 44068, 44069, 44071, 44072, 44073, 44079, 44080, 44083, 44087, 44093, 44095, 44098, 44099, 44101, 44104, 44105, 44106, 44111, 44113, 44115, 44116, 44117, 44119, 44123, 44124, 44134, 44135

PERMEABILITY
43569, 43933

PERMITS
43540, 44078, 44093

PEROXYACETYL NITRATE
43551, 43822, 43952, 43957, 44036, 44042, 44044, 44047, 44139

PEROXYACYL NITRATES
43551, 43822, 43908, 43952, 43957, 44036, 44042, 44044, 44047, 44139

PERSONNEL
43758, 43794, 44050, 44084

PERSONNEL QUALIFICATIONS
44084

PESTICIDES
43617, 43789, 43798, 43815, 43966, 44007, 44135

PETER SPENCE PROCESS (CLAUS)
43664, 43667

PETROLEUM AND COAL PRODUCTS INDUSTRY
43567, 43579, 43660, 44035

PETROLEUM DISTRIBUTION
43570, 43686, 43690, 43694, 43696, 43700, 43701, 43703, 43706, 43710, 44120, 44124

PETROLEUM REFINING
43567, 43579, 43660, 44035

PH
43708, 43719, 43826, 43841, 43877, 43905, 44023, 44031, 44038, 44091

PHENOLS
43512, 43591, 43667, 43719, 43904

PHENYL COMPOUNDS
43969

PHENYLS
43969

PHILADELPHIA
43552

PHOSPHORIC ACID
44068

PHOSPHOROUS ORGANIC COMPOUNDS
43798

PHOSPHORUS COMPOUNDS
43923, 44068

PHOTOCHEMICAL REACTIONS
43524, 43752, 43806, 43826, 43853, 43883, 43890, 43893, 43899, 43902, 43906, 43908, 43917, 43918, 43940, 43941, 43948, 43951, 43952, 43957, 44013

PHOTOELECTRIC PHENOMENA
43769

PHOTOLYSIS
43893, 43940

PHOTOMETRIC METHODS
43803, 43846, 43887, 43910, 43912

PHOTOOXIDATION
43826

PHOTOSYNTHESIS
44013, 44015, 44038

PHTHALIC ACID
43798

PHYTOTOXICANTS
43617, 44032

PILOT PLANTS
43537, 43615, 43626, 43682, 43708, 43712

PITTSBURGH
43519

PLAINS
43884, 43898

PLANNING AND ZONING
43539, 43812, 43840, 44021, 44052, 44086, 44118, 44121, 44127, 44129

PLANT DAMAGE
43529, 43541, 43840, 43902, 43995, 44012, 44013, 44016, 44017, 44018, 44024, 44025, 44026, 44027, 44036, 44040, 44041, 44042, 44044, 44045, 44047, 44074, 44091, 44139

PLANT GROWTH AND DEVELOPMENT
44013, 44015, 44031, 44035, 44038, 44043

PLANT INDICATORS
44015, 44019, 44021, 44025, 44028, 44044, 44047

PLASTICS
43626, 43939, 44048

PLATING AND POLISHING
43646

PLUME BEHAVIOR
43821, 43835, 43850, 43867, 43869, 43870, 43951

POINT SOURCES
43551, 43853, 43905

POLLENS
43991

POLYMERIZATION
43567, 43622

POLYNUCLEAR COMPOUNDS
43551, 43774, 43793, 43830, 43906, 43929, 43945, 43966, 43983, 43984, 43987, 43994

POTASSIUM COMPOUNDS
43884

POTENTIOMETRIC METHODS
43757, 43781, 43814

POWER CYCLES
43725, 43727

POWER SOURCES
43513, 43521, 43522, 43524, 43531, 43540, 43543, 43549, 43555, 43558, 43587, 43593, 43596, 43602, 43612, 43624, 43637, 43642, 43649, 43653, 43669, 43671, 43675, 43680, 43683, 43689, 43691, 43693, 43695, 43713, 43714, 43715, 43716, 43718, 43720, 43721, 43722, 43725, 43726, 43727, 43729, 43730, 43731, 43733, 43734, 43736, 43737, 43738, 43739, 43741, 43742, 43745, 43746, 43747, 43749, 43788, 43807, 43818, 43935, 44002, 44003, 44073, 44116

PRECIPITATION
43506, 43536, 43544, 43545, 43559, 43582, 43805, 43836, 43841, 43842, 43851, 43856, 43864, 43875, 43877, 43880, 43881, 43891, 43905, 44031, 44039

PRIMATES (NON-HUMAN)
43960

PROCESS MODIFICATION
43513, 43525, 43553, 43557, 43574, 43595, 43602, 43604, 43620, 43631, 43645, 43649, 43658, 43662, 43664, 43675, 43683, 43688, 43713, 43723, 43729, 43732, 43750, 43794, 43942

PROPANES
43799, 43809, 43816, 43898

PROPENES
43799, 43809

PROTEINS
43789, 43999, 44006, 44027, 44037

PUBLIC AFFAIRS
43786, 43810

PUBLIC INFORMATION
43786, 43810

PULMONARY FUNCTION
43970, 44004, 44005

PULMONARY RESISTANCE
44004, 44005

PULP MILLS
43580, 43613

PYRENES
43551, 43830, 43929, 43983, 43984, 43987, 43994

PYROLYSIS
43682, 43698, 43747

Q

QUARTZ
43784

QUENCHING
43769

QUESTIONNAIRES
44084

QUINOLINES
44030

QUINONES
43719

R

RABBITS
43963

RADIOACTIVE RADIATION
43541, 43769, 43825, 44032, 44135, 44137

RADIOACTIVE TRACERS
43811, 43885, 43895, 43913, 44006

RADON
43895

RAILROAD VEHICLES
43745

RAIN
43536, 43544, 43582, 43836, 43841, 43875, 43880, 43881, 44031, 44039

RANKINE CYCLE ENGINES
43689, 43715, 43716, 43720, 43721, 43729, 43730, 43733, 43734, 43737, 43738, 43818

RAPPING
43597, 43599, 43608, 43800

RATS
43965, 43975, 43980, 43988, 43993, 44006, 44007, 44008, 44011

REACTION KINETICS
43549, 43580, 43616, 43709, 43724, 43727, 43883, 43890, 43917, 43922, 43923, 43937, 43938, 43947, 43948, 43956

REACTION MECHANISMS
43549, 43580, 43645, 43709, 43732, 43761, 43853, 43906, 43922, 43925, 43930, 43935, 43936, 43938, 43945, 43947, 43948, 43951, 44030

REACTORS (NUCLEAR)
43539, 43540

RECOMBINATION
43928, 43940

RECORDING METHODS
44072

REDUCTION
43612, 43655, 43724, 43890, 43891, 43947

REFRACTIVE INDEX
43783, 43801, 43806, 43849, 43882

REFUSE SYSTEMS
43509, 43515, 43526, 43535, 43572, 43586, 43600, 43616, 43620, 43643, 43658, 43687, 43688, 43735, 43845, 43865, 44002, 44003, 44049, 44056, 44067, 44072, 44081, 44123, 44135

REGULATIONS
43547, 43572, 44071, 44079, 44080, 44084, 44088, 44092, 44093, 44097, 44099, 44100, 44105, 44106, 44107, 44109, 44116, 44120, 44123, 44124

RENDERING PLANTS, GREASE AND TALLOW
44083

REPRODUCTION (BIOLOGICAL)
43971, 43980, 44007

RESEARCH METHODOLOGIES
43852, 43984, 44126

RESEARCH PROGRAMS
43691, 43715, 43858, 44108

RESIDENTIAL AREAS
43834, 43845, 44052

RESIDUAL OILS
43533, 43579, 43632, 43673

RESPIRATION (PLANTS)
44020, 44037

RESPIRATORY DISEASES
43970, 43974, 43978, 43986, 43987, 43989, 43991, 43992, 43993, 43994, 43999, 44002, 44003, 44005

RESPIRATORY SYSTEM
43950, 43954, 43965, 43974, 43982, 43983, 43984, 43993, 43994, 43997, 43999, 44002, 44003, 44006, 44011

RETENTION
43688, 43962, 43979, 43981, 43983, 43984, 43996, 44021

RINGELMANN CHART
44111

RIVERS
43545, 43851

ROADS
43510, 43528, 43726, 43820, 43894, 43896, 44125

ROTARY ENGINES
43714, 43818

ROTARY PISTON ENGINES
43714, 43818

RUBBER
43969

RUBBER AND MISCELLANEOUS PLASTICS PRODUC
43599, 43966

RUBBER PRODUCTION
43599, 43966

S

SALTZMAN METHOD (NOX)
43824

SAMPLERS
43736, 43754, 43766, 43770, 43771, 43777, 43808, 43818, 43823, 43824, 44137

SAN FRANCISCO
43704, 43887

SANITARY SERVICES
43509, 43515, 43526, 43535, 43572, 43586, 43600, 43616, 43620, 43628, 43629, 43643, 43658, 43687, 43688, 43735, 43811, 43845, 43865, 44002, 44003, 44049, 44056, 44067, 44072, 44081, 44123, 44135

SAPPORO
43834

SCANDINAVIA
43544, 43585, 43613, 43826, 43842, 43877, 44010, 44016

SCATTERING (ATMOSPHERIC)
43806, 43849, 43850, 43861, 43862, 43909, 43910, 43911, 43914, 43915

SCRUBBERS
43560, 43574, 43578, 43583, 43586, 43600, 43603, 43618, 43623, 43625, 43629, 43635, 43638, 43646, 43647, 43659, 43663, 43677, 43684, 43688, 43708, 43711, 43719, 43744, 43752, 43844, 44051, 44066, 44068

SEA SALTS
43833, 43836

SECONDARY AIR
43553, 43602, 43662

SEDIMENTATION
43881, 43908

SELENIUM COMPOUNDS
43545, 43838

SETTLING CHAMBERS
43574, 43688, 43752

SETTLING PARTICLES
43505, 43507, 43512, 43528, 43529, 43534, 43536, 43537, 43541, 43559, 43560, 43561, 43569, 43581, 43582, 43583, 43584, 43588, 43591, 43595, 43597, 43603, 43608, 43610, 43614, 43626, 43635, 43650, 43667, 43677, 43687, 43727, 43740, 43752, 43753, 43760, 43770, 43771, 43784, 43796, 43800, 43830, 43833, 43836, 43840, 43841, 43847, 43848, 43855, 43856, 43901, 43903, 43912, 43919, 43936, 43958, 43966, 43989, 43994, 44009, 44011, 44032, 44091, 44115, 44121, 44123

SEWAGE TREATMENT
43628, 43811, 43845

SEWERAGE SYSTEMS
43628, 43629, 43811, 43845, 44056, 44067

SILICATES
43564, 43615, 43654, 43926

SILICON COMPOUNDS
43564, 43615, 43654, 43884, 43926, 43969

SILICON DIOXIDE
43641, 43654, 43926, 44011

SIMULATION
43704, 43719, 43726, 43736, 43744, 43866, 43883, 43921, 43948, 43982, 44021

SINTERING
43800

SKIN TESTS
43989, 43998

SLUDGE
43628, 43629, 44056, 44067

SMOG
43524, 43550, 43776, 43806, 43822, 43837, 43878, 43890, 43902, 43906, 43919, 43948, 43968, 43971

SMOKE SHADE
43800, 44063, 44065, 44066, 44069, 44111

SMOKEMETERS
43800

SMOKES
43529, 43548, 43578, 43583, 43637, 43642, 43680, 43693, 43713, 43720, 43729, 43747, 43770, 43776, 43788, 43840, 43841, 43919, 43984, 43994, 44002, 44003, 44026, 44032, 44035, 44063, 44080, 44091

SMOKING
43960, 43986, 44002

SNOW
43545, 43559

SOCIO-ECONOMIC FACTORS
43539, 43540, 43541, 43542, 43552, 43558, 43691, 43734, 43840, 44050, 44052, 44055, 44057, 44058, 44060, 44062, 44077, 44081, 44082, 44107, 44127

SODIUM COMPOUNDS
43580, 43855, 43884

SOILS
43536, 43544, 43545, 43761, 43775, 43836, 43877, 43891, 43893, 43905, 43995, 44031

SOLAR RADIATION
43805, 43827, 43846, 43849, 43862, 43882, 43899, 43907, 43908, 43912, 43915, 43919, 43941, 43948

SOLVENTS
43616, 43633, 43735, 43966, 43975

SOOT
43528, 43537, 43559, 43608, 43796, 43936, 43966

SOURCE MONITORING
43530, 43767, 43770, 43771, 43796, 43800, 44079

SOUTH AMERICA
43842, 43847, 43851

SOUTH PACIFIC
43641, 43842, 43971

SOX CONTROL
43550, 43579, 43586, 43603, 43622, 43623, 43654, 43664, 43667, 43672, 43684, 43705, 43708, 43709, 43719, 43732, 44056, 44079, 44092, 44101, 44134

SPARK IGNITION ENGINES
43513, 43531, 43549, 43649, 43683, 43718, 43720, 43788, 43935

SPARK TIMING
43596, 44073

SPECTROMETRY
43695, 43755, 43756, 43762, 43766, 43768, 43769, 43772, 43780, 43784, 43788, 43789, 43792, 43793, 43795, 43797, 43799, 43803, 43806, 43815, 43817, 43823, 43824, 43825, 43838, 43845, 43846, 43858, 43889, 43911, 43912, 43914, 43929, 43940, 43945

SPECTROPHOTOMETRY
43769, 43780, 43793

SPERMATOZOA
43971

SPINACH
44013, 44017, 44024

SPORES
43506, 43585

SPRAY TOWERS
43603

SPRAYS
44032

ST LOUIS
43838, 43892

STABILITY (ATMOSPHERIC)
43551, 43772, 43776, 43830, 43850, 43865, 43874, 43876, 43892, 43900, 43901, 43905, 43908, 43920, 43958

STACK GASES
43509, 43515, 43518, 43520, 43521, 43525, 43544, 43545, 43550, 43553, 43557, 43559, 43560, 43561, 43563, 43565, 43566, 43574, 43577, 43578, 43579, 43586, 43588, 43589, 43595, 43599, 43600, 43603, 43607, 43608, 43618, 43619, 43620, 43622, 43623, 43629, 43630, 43631, 43633, 43635, 43644, 43646, 43654, 43656, 43657, 43658, 43663, 43664, 43668, 43670, 43674, 43677, 43684, 43688, 43705, 43708, 43709, 43712, 43719, 43723, 43727, 43732, 43735, 43770, 43785, 43793, 43794, 43796, 43835, 43839, 43867, 43869, 43899, 43911, 43995, 44002, 44018, 44032, 44063, 44065, 44066, 44068, 44079, 44080, 44092, 44107, 44123, 44134

STACK MONITORING
43770, 43771, 43796, 44079

STACKS
43518, 43521, 43559, 43869, 43916, 44092, 44121, 44123, 44134

STAGNATION
43830, 43908

STATE GOVERNMENTS
44050, 44105, 44119, 44120, 44135

STATIONARY EMISSION SOURCES
43508, 43509, 43512, 43513, 43514, 43515, 43518, 43521, 43522, 43523, 43525, 43526, 43529, 43531, 43533, 43534, 43535, 43536, 43537, 43538, 43539, 43540, 43541, 43542, 43543, 43544, 43545, 43548, 43550, 43551, 43552, 43553, 43554, 43555, 43556, 43557, 43558, 43559, 43561, 43563, 43567, 43570, 43571, 43572, 43579, 43580, 43581, 43582, 43586, 43588, 43589, 43591, 43594, 43595, 43596, 43599, 43600, 43603, 43604, 43609, 43610, 43613, 43614, 43615, 43616, 43619, 43620, 43626, 43627, 43628, 43629, 43631, 43632, 43633, 43635, 43638, 43642, 43643, 43646, 43649, 43657, 43658, 43659, 43660, 43663, 43664, 43665, 43667, 43670, 43673, 43679, 43681, 43682, 43683, 43684, 43686, 43687, 43688, 43690, 43691, 43694, 43696, 43698, 43700, 43701, 43703, 43705, 43706, 43707, 43708, 43710, 43712, 43720, 43723, 43725, 43726, 43727, 43728, 43732, 43735, 43736, 43738, 43739, 43741, 43742, 43743, 43748, 43750, 43753, 43758, 43773, 43784, 43793, 43800, 43811, 43823, 43828, 43835, 43840, 43845, 43853, 43855, 43860, 43865, 43868, 43870, 43882, 43899, 43903, 43906, 43926, 43949, 43964, 43966, 43972, 43973, 43975, 43985, 43995, 44002, 44003, 44009, 44012, 44014, 44018, 44021, 44029, 44032, 44035, 44042, 44049, 44052, 44055, 44056, 44058, 44059, 44061, 44062, 44065, 44067, 44068, 44069, 44071, 44072, 44077, 44078, 44079, 44080, 44081, 44082, 44083, 44090, 44091, 44097, 44104, 44105, 44107, 44110, 44115, 44120, 44123, 44124, 44134, 44135, 44137

STATISTICAL ANALYSES
43744, 43827, 43832, 43840, 43848, 43864, 43868, 43876, 43878, 43932, 43941, 43967, 43971, 43981, 44043

STEAM
43577

STEAM ELECTRIC POWER GENERATION
43508, 43521, 43541, 43542, 43631, 43642, 43705, 44059, 44061, 44072

STEAM ENGINES
43689, 43715, 43716, 43720, 43721, 43729, 43730, 43733, 43734, 43737, 43738, 43818

STEEL
43520, 43553, 43635, 43677

STRATIFIED CHARGE ENGINES
43596, 43715, 43818

STREETS
43528, 43820, 43894

STRONTIUM COMPOUNDS
43895

STRUCTURES
43583, 43611, 43666, 43823

STYRENES
43969

SULFATES
43506, 43509, 43537, 43752, 43826, 43841, 43854, 43877, 43917, 43936, 43949, 43972, 44034

SULFATION-OF-LEAD METHODS
43765

SULFHYDRYL COMPOUNDS
44027

SULFIDES
43506, 43512, 43526, 43567, 43580, 43615, 43621, 43634, 43648, 43659, 43664, 43672, 43674, 43727, 43732, 43760, 43790, 43805, 43824, 43832, 43844, 43851, 43917, 43924, 43938, 43969, 44083, 44102

SULFITES
43525, 44030

SULFONIC ACID
43929

SULFUR COMPOUNDS
43506, 43509, 43512, 43525, 43526, 43537, 43567, 43579, 43580, 43613, 43615, 43621, 43634, 43641, 43648, 43659, 43664, 43665, 43667, 43672, 43674, 43712, 43727, 43732, 43739, 43752, 43760, 43790, 43799, 43805, 43824, 43826, 43832, 43834, 43838, 43841, 43844, 43851, 43854, 43877, 43917, 43924, 43936, 43938, 43949, 43969, 43972, 44023, 44030, 44034, 44079, 44083, 44090, 44102, 44130

SULFUR DIOXIDE
43509, 43512, 43518, 43529, 43551, 43559, 43589, 43634, 43655, 43672, 43678, 43760, 43765, 43769, 43781, 43790, 43805, 43807, 43814, 43816, 43821, 43822, 43823, 43824, 43826, 43829, 43839, 43840, 43841, 43844, 43850, 43877, 43899, 43903, 43905, 43906, 43917, 43918, 43925, 43929, 43936, 43938, 43961, 43970, 43974, 43999, 44004, 44005, 44015, 44017, 44018, 44019, 44020, 44022, 44023, 44024, 44026, 44027, 44028, 44029, 44033, 44034, 44035, 44036, 44037, 44038, 44039, 44042, 44044, 44046, 44047, 44063, 44068, 44081, 44091, 44092, 44101, 44105, 44134, 44135, 44136, 44137, 44139

SULFUR ORGANIC COMPOUNDS
43512, 43580, 43617, 43659, 43799, 43938, 44027

SULFUR OXIDES
43509, 43512, 43518, 43525, 43529, 43534, 43535, 43550, 43551, 43559, 43589, 43601, 43608, 43611, 43634, 43655, 43670, 43672, 43678, 43684, 43688, 43760, 43765, 43769, 43781, 43790, 43796, 43805, 43807, 43814, 43816, 43821, 43822, 43823, 43824, 43826, 43829, 43839, 43840, 43841, 43844, 43850, 43877, 43899, 43903, 43905, 43906, 43917, 43918, 43924, 43925, 43929, 43936, 43938, 43961, 43970, 43972, 43974, 43999, 44002, 44003, 44004, 44005, 44015, 44017, 44018, 44019, 44020, 44022, 44023, 44024, 44026, 44027, 44028, 44029, 44033, 44034, 44035, 44036, 44037, 44038, 44039, 44042, 44044, 44046, 44047, 44059, 44063, 44068, 44079, 44080, 44081, 44090, 44091, 44092, 44101, 44102, 44103, 44105, 44123, 44126, 44134, 44135, 44136, 44137, 44139

SULFUR TRIOXIDE
43512, 43525, 43608, 43655, 43765, 43790, 43796, 43917, 43918, 43972, 44018, 44081

SULFURIC ACID
43509, 43537, 43623, 43678, 43792, 43903, 43917, 43918, 43947, 43972, 44056, 44072, 44092

SURFACE COATING OPERATIONS
43616, 43633

SURFACE PROPERTIES
43566, 43733, 43851, 43880, 43925, 43926, 43934, 43939, 43947, 43956

SURVEY METHODS
43505, 43765, 43805, 43820, 43839, 44108, 44118, 44122, 44126, 44136, 44137

SUSPENDED PARTICULATES
43518, 43524, 43529, 43548, 43550, 43561, 43578, 43581, 43583, 43588, 43589, 43611, 43636, 43637, 43642, 43663, 43678, 43680, 43687, 43688, 43693, 43708, 43713, 43720, 43729, 43747, 43752, 43753, 43765, 43768, 43770, 43776, 43777, 43788, 43801, 43802, 43806, 43822, 43823, 43826, 43837, 43840, 43841, 43870, 43878, 43881, 43890, 43902, 43906, 43908, 43917, 43918, 43919, 43923, 43943, 43948, 43968, 43971, 43984, 43985, 43991, 43994, 44002, 44003, 44026, 44032, 44035, 44042, 44063, 44080, 44091, 44123, 44130, 44137

SWEDEN
43544, 43826, 43842, 43877, 44016

SYNERGISM
43961, 43965, 43974, 43976, 43993, 43999, 44004, 44017, 44021, 44024, 44040

SYNTHETIC RUBBER
43969

T

TAXATION
44050, 44052, 44135

TECHNICAL SOCIETIES
44084

TEFLON
43626, 43939

TEMPERATURE
43565, 43584, 43585, 43588, 43592, 43597, 43601, 43608, 43622, 43630, 43637, 43660, 43662, 43669, 43688, 43694, 43699, 43724, 43732, 43750, 43770, 43773, 43871, 43925, 43926, 43927, 43935, 43953, 44023, 44040, 44116

TEMPERATURE (ATMOSPHERIC)
43776, 43805, 43851, 43854, 43856, 43860, 43864, 43865, 43868, 43872, 43873, 43876, 43877, 43878, 43882, 43886, 43892, 43897, 43901, 43905, 43907, 43910, 43915, 43919, 43920, 44022

TEMPERATURE GRADIENT
43958

TENSILE STRENGTH
43606

TETRAETHYL LEAD
43555, 43972, 43975

TEXAS
43824

TEXTILE MILLS
43512, 43572

THERMAL RADIATION
43539, 43541, 43542, 43862, 43886, 43892, 43901, 43907, 43919, 43958

THERMODYNAMICS
43724, 43871, 43925, 43943

THIN-LAYER CHROMATOGRAPHY
43778

THRESHOLDS
43976, 43979, 43983, 43996, 44010, 44041, 44045

THUNDERSTORMS
43856

TIMED FUEL INJECTION
43637, 43695, 43747

TIN COMPOUNDS
43795

TISSUES
43965

TOBACCO
44040, 44041, 44047

TOKYO
43876

TOLUENES
43799, 43809, 43975

TOMATOES
44031

TOPOGRAPHIC INTERACTIONS
43852, 43856, 43868, 43886, 43892, 43901, 43916, 43919

TOXIC TOLERANCES
43529, 44032, 44035, 44036, 44039, 44044, 44045

TOXICITY
43840, 43932, 43952, 43960, 43961, 43962, 43966, 43967, 43969, 43972, 43974, 43975, 43976, 43978, 43979, 43983, 43985, 43988, 43993, 43995, 43996, 44001, 44006, 44007, 44008, 44009, 44010 44013, 44017, 44024, 44025, 44034, 44036, 44038, 44040, 44041, 44045, 44075, 44076

TRACE ANALYSIS
43755, 43775, 43811

TRACERS
43811, 43818, 43852, 43885, 43895, 43913, 43968, 44006

TRANSPORT
43506, 43545, 43833, 43836, 43847, 43855, 43859, 43877, 43883, 43886, 43888, 43900, 43905, 43906, 43913, 43952, 43995, 44126

TRANSPORTATION METHODS
43507, 43510, 43514, 43517, 43519, 43522, 43527, 43528, 43531, 43532, 43535, 43538, 43546, 43548, 43550, 43551, 43570, 43582, 43604, 43609, 43651, 43652, 43656, 43662, 43680, 43681, 43685, 43686, 43692, 43701, 43702, 43704, 43717, 43724, 43745, 43748, 43751, 43792, 43803, 43814, 43820, 43827, 43828, 43840, 43850, 43858, 43873, 43883, 43885, 43890, 43893, 43894, 43896, 43905, 43906, 43908, 43942, 43972, 43976, 43985, 43996, 44002, 44003, 44049, 44052, 44053, 44054, 44057, 44059, 44073, 44075, 44076, 44081, 44082, 44089, 44093, 44100, 44116, 44120, 44121, 44125, 44127, 44129

TREES
44018, 44026, 44027, 44035, 44039, 44091

TRENDS
43514, 43517, 43531, 43539, 43540, 43541, 43542, 43544, 43546, 43548, 43558, 43586, 43609, 43625, 43691, 43829, 43835, 43889, 43890, 43997, 44029, 44055, 44058

TRUCKS
43528, 43531, 43686, 44073, 44116

TUMORS
43966, 43967, 43969, 43983, 43988, 44002, 44003, 44011

TURBIDIMETRY
43822, 43842, 43910

TURBULENCE (ATMOSPHERIC)
43787, 43806, 43832, 43886, 43892, 43896, 43905

U

ULTRAVIOLET RADIATION
43551, 43803, 43806, 43873, 43941, 43957

ULTRAVIOLET SPECTROMETRY
43695, 43793, 43803, 43940

UNDERFIRE AIR
43688

UNITED KINGDOM
43525, 43555, 43569, 43579, 43582, 43587, 43589, 43630, 43634, 43656, 43762, 43784, 43800, 43806, 43817, 43836, 43840, 43842, 43858, 43899, 43916, 43927, 43928, 43970, 43971, 43997, 44029, 44035, 44039, 44055, 44058

UNITED STATES
43509, 43511, 43519, 43535, 43550, 43552, 43704, 43822, 43824, 43827, 43828, 43832, 43838, 43842, 43844, 43846, 43850, 43880, 43887, 43892, 43920, 44042, 44070, 44079, 44081, 44087, 44089, 44090, 44092, 44094, 44095, 44096, 44098, 44099, 44100, 44101, 44102, 44103, 44105, 44106, 44110, 44111, 44113, 44117, 44119, 44120, 44124, 44126, 44129, 44134

UPPER ATMOSPHERE
43847, 43854, 43855

URANIUM COMPOUNDS
43541

URBAN AREAS
43509, 43512, 43517, 43519, 43528, 43534, 43537, 43541, 43543, 43548, 43550, 43552, 43704, 43726, 43805, 43812, 43820, 43824, 43828, 43830, 43837, 43838, 43840, 43850, 43852, 43866, 43880, 43886, 43887, 43892, 43894, 43897, 43899, 43901, 43902, 43907, 43915, 43916, 43919, 43941, 43961, 43970, 43976, 43986, 43987, 43996, 44002, 44005, 44021, 44022, 44023, 44033, 44035, 44039, 44053, 44054, 44070, 44075, 44076, 44118, 44122, 44129, 44136

URINE
43761, 43981, 43996, 44000

USSR
43560, 43562, 43564, 43567, 43588, 43615, 43674, 43699, 43743, 43790, 43831, 43842, 43861, 43862, 43864, 43881, 43903, 43932, 43943, 43949, 43953, 43965, 43980, 44006, 44007, 44019

UTAH
44092

V

VALLEYS
43916

VANADIUM COMPOUNDS
43780, 43795, 44130

VAPOR PRESSURE
43557, 43694, 43697

VAPOR RECOVERY SYSTEMS
43547, 43570, 43686, 43690, 43694, 43696, 43697, 43700, 43701, 43702, 43703, 43706, 43707, 43710, 44120

VAPORS
43515, 43547, 43554, 43562, 43570, 43577, 43587, 43602, 43686, 43690, 43694, 43697, 43699, 43700, 43701, 43702, 43703, 43706, 43707, 43742, 43761, 43778, 43845, 43860, 43885, 43886, 43911, 43916, 43918, 43922, 43939, 43978, 44120

VEGETABLES
43775, 44013, 44017, 44024, 44030, 44031, 44042

VENTILATION
43588, 43589, 43611, 43629, 43643, 43666, 43687

VENTILATION (PULMONARY)
43970, 44004

VENTURI SCRUBBERS
43600, 43635, 43744, 44051

VESSELS (MARINE)
43656

VIRGINIA
44096

VIRUSES
43506

VISIBILITY
43776, 43868

VISIBLE RADIATION
43806, 43941

VOLATILITY
43544, 43555, 43761

VOLCANOES
43536, 43545

VOLTAGE
43650, 44015

W

WASHINGTON (STATE)
44110, 44117

WASHINGTON D C
43704, 44129

WASHOUT
43506, 43851, 43875, 43880, 43881, 43891, 43905

WASTE GAS CONTROL
43550, 43579, 43586, 43603, 43622, 43623, 43654, 43664, 43667, 43672, 43684, 43705, 43708, 43709, 43719, 43732, 44056, 44079, 44092, 44101, 44134

WASTE GASES
43509, 43515, 43518, 43520, 43521, 43525, 43544, 43545, 43550, 43553, 43557, 43559, 43560, 43561, 43563, 43565, 43566, 43574, 43577, 43578, 43579, 43586, 43588, 43589, 43595, 43599, 43600, 43603, 43607, 43608, 43618, 43619, 43620, 43622, 43623, 43629, 43630, 43631, 43633, 43635, 43644, 43646, 43654, 43656, 43657, 43658, 43663, 43664, 43668, 43670, 43674, 43677, 43684, 43688, 43705, 43708, 43709, 43712, 43719, 43723, 43727, 43732, 43735, 43770, 43785, 43793, 43794, 43796, 43835, 43839, 43867, 43869, 43899, 43911, 43995, 44002, 44018, 44032, 44063, 44065, 44066, 44068, 44079, 44080, 44092, 44107, 44123, 44134

WATER
43515, 43554, 43594, 43646, 43725, 43737, 43742, 43801, 43802, 43860, 43870, 43885, 43886, 43911, 43914, 43916, 43918, 43922

WATER BODIES
43591, 43613, 43761, 43811, 43840, 43841, 44000, 44049, 44081, 44135

WATER POLLUTION
43591, 43613, 43761, 43811, 43840, 43841, 44000, 44049, 44081, 44135

WEATHER MODIFICATION
43840, 43860, 43863, 43872, 43873, 43886, 43892, 43901, 43907, 43915, 43916, 43919

WEST AND GAEKE METHOD (SO2)
43824

WET CYCLONES
43583, 43629

WETTING
43582, 43687, 44022

WHEAT
44016

WIND ROSE
44137

WIND TUNNELS
43534, 43582, 43852

WINDS
43528, 43534, 43582, 43805, 43827, 43832, 43835, 43839, 43850, 43852, 43854, 43856, 43864, 43865, 43874, 43877, 43886, 43892, 43896, 43905, 43907, 43911, 44137

X

X-RAYS
43769, 43825

XYLENES
43799, 43809, 43939, 43975

Y

YOKKAICHI
43839, 43866

Z

ZINC
44063

ZINC COMPOUNDS
43795, 43848, 43963, 43964, 44008, 44032, 44036

AUTHOR INDEX

A

ABRIGEON E 43977
ADAM D E *43682
ADAMS C N *43849
ADDOMS R B 43689
ADT R R JR *43683
AGARWAL J K 43783
AIMAN W R *43549
AJEMIAN R S 43780
AKIYAMA K *43808
AKULICH S S *43562
ALBRO P W 43789
ALBUS C J JR 43824
ALI ZADE E M 43615
ALIYEV A M 43699
ALLEN E R *43908
ALTWICKER E R *43563, 43719
AMICK R S *43505
AMIROVA S A *43564
ANASTASIA L 43732
ANDERSEN A A *43754
ANDERSON J A 43844, 43850
ANDREASSON K 43826
ANDREYEV I A 43743
ANGERER J *43755
AOYAMA T *43843
ARAKI K 43776
ARAKI S *43981
ARASHI N *43565
ARIMAN T *43711, 43740
ARONOW W S *43960
ASAI K *43756
ASBURY J G 43539, 43540, 43541, 43542
ASHBY H A 43818
ATKINS P R 43793
ATSUKAWA M *43566
AUERSCH O *44012
AVERBUKH T D *43567
AVONDOGLIO L *43568
AXETELL K JR 43505

B

BABCOCK L R JR *44059
BABICH H *43506
BADDELEY M S *44020, *44021
BAGIROV R A 43615
BAILIE J D 43642
BAKER A F 43627
BAKINA N P 43567
BALL F J *43712
BALL R H *43550
BARBER K F 43716, 43737
BARLOW G *43569
BARNA G G *43757
BARSIC N J 43782, 43822
BATCHELDER A H *43570
BATES D V *43961
BATES R R 43983
BATTIGELLI M C *43993, *44004, *44005
BAUM F *43758
BAUM J P *43571
BAY H W *43759
BAZELMANS C L *43684
BECHTHOLD J L *44137
BECK E G 43994
BECKER K H 43938
BELLOMO S *43685
BELSKY T 43793
BERGLUND R N 43783
BERMAN B 43726
BERRY R S *43906
BETHEA R M 43824
BIERSTEKER K *43987
BINFORD F T 43684
BIRKLE M *43760
BJURMAN J 44016
BLACK F M *43809
BLAIR MCGUFFIE M H *43572
BLOCK M J *43573
BLOKKER P C *44122
BLUMENTHAL D L *43850
BLURTON K F 43759
BLY R L *43713
BOEGMAN N *43574
BOFFA C V *43955
BORYCZKA J 43559
BOWDEN B J *44055
BOWEN M D *43575
BOWLING S A *43920
BOYD N F *43576
BRACCO F V *43714
BRADFORD C M 43889
BRAMAN R S *43761
BRASSER L J *43551, *43814
BREEDING R J *43844
BRESSAN D J *43536
BRESSER 43528
BRINKMANN W L F *43851
BRISSE A H *43753
BROCKE W *43507
BROCKHAUS A 43830, *43994
BROGAN J J *43715
BROOKS J N 43889
BROOKS R D *43716
BROSSET C *43826
BROWN G N 43712
BROWN H L *43552
BROWNRIGG J T *43815
BRUNTZ S M *43827
BRYZIK W 43747
BUEHRING W A 43539, 43540, 43541, 43542
BUONICORE A J 43744
BURNYSHEV A K 43949
BUTLER J W 43527
BUXMANN J *43508

C

CAHN R P 43609
CALVERT J G 43948
CAMBRAY R S 43836
CAMPE K M 43734
CANTWELL E N *43717
CARLBERG J R 43780
CARLS E L 43732
CAROTTI A A *43509
CARR R A 43536
CARSON B L 43978
CASSET A 43977
CASTOR J G *43718
CATINI C 44008
CAVATASSI D *43578
CAWSE P A 43836
CERMAK J E *43852
CESARIO F J *43510, *43511
CHAMBERLAIN R E *43750
CHANDLER G *43579
CHANDRASEKARAN K *43580
CHANG C W *44013
CHANG J S *43883
CHANG S G 43936
CHAPURSKY L I 43861
CHARLSON R J *43909, *43910
CHARPENTIER J C *43921
CHATTERJI M *44077
CHATTOPADHYAY A 43775
CHEETHAM H A 43525
CHEKLICH G E 43747
CHIROIU N 43644
CHOCHOLAC M *43581
CHOVIN P *43962
CINKOTAI F F *43982
CISCO R L 43686
CLEMESHA B R *43847
CLEVELAND W S 43827
CLINK W L 43823
CLOUGH P N 43924
COAKLEY R D 43658
COLE J F *43963
COLEMAN R F *43762
COLIN M 43973
COLLINS J B 43652
COLLOMBEL C 43764
COMPTON W A 43689, 43721, 43746
CONRADS L A *43901
COOPER J A 43838
COPONY E 43686
COPPINS B J *44022, 44029
CORCORAN W H 43922
CORRIDAN J P *43964
COTE W A 43823
COUNTERMAN P *43719
CUNNINGHAM A R 43609
CUNNINGHAM R G JR *44078

D

D SILVA A P 43769
DABBERDT W F 43892
DAESSLER H G *44014
DAITO S 43930
DATIS A 43690
DAVIES D S *44056
DAVIES G M *43582
DAVIS J E 43712
DAVIS K R 43865
DAVIS R C 43718
DAVIS S R *43720
DAVYDOVA V I *43965
DE VRIES K 43986
DEANE C T *43583
DEBRUN D 43926

DECKER I D *43686
DEHNEN W 43994
DELANY A C *43884
DEMARCO J *43687, *43688, *44123
DEMERJIAN K L *43948
DERR J A 43948
DERR V E *43911
DESCOLAS M *43584
DEVITT T W *44072
DEWEES D N *44057
DEYSING G *43512
DIERY H 43863
DOBNER S I 43727
DOLE S 43550
DONNELLY J P 43734
DONTENWILL W 43791
DOORN W G V *44015
DOYLE E 43738
DRAFTZ R G *43828
DRAVNIEKS A *43763
DRISCOLL J 43780
DUBOIS K P 43539, 43540, 43541, 43542
DUBOIS L *43537
DUCE R A 43833
DUEKER R L *43810
DUFFY T E *43689, *43721
DULEY W W 43946
DUNLAP K L 43778
DUNLEVY R D 43684
DUNN H S *43722
DURANDEU A *43764
DURHAM J 43828
DURRANT O W *43723
DYRE M *43585

E

EAMES J P 43621
EAST C *43907
EBERAN EBERHORST R *43513
ECKARD S E 43716
EDELSON Y 44001
EDWARDS H W *43724
EHHALT D H *43885
ENDERS K 44091
ENDO K *43765
ENGLAND C *43922
ENGLERT T R 43844
EPSTEIN S S *43966
ERSKINE D W *44073
ESCHER W J *43538
ESCHER W J D *43725
ESTERBAUER H 44027
ETTINGER H J *43766
EVANS R J *43586

F

FABRICK A J *43853
FARKHADOV T S 43615
FARMER M H 43609
FARRAR J F *44023
FASSEL V A 43769
FAZZARI C *44008
FEDAK D G 43925
FELICIANO A *44042
FERGUSON T L 43978
FERM M 43826
FERRAIOLO G 43869
FERRY B W 44020, 44021
FINEGAN E J 44020
FISHER D *43587
FISHMAN B D *43588
FLEMMING G *43829
FLODIN K 44016
FLUX J H *43589
FODOR G G 43976
FOGLE B 43844
FOLTZ D R *43590
FOLTZ V C *43967
FONTANGES R 43977
FOWLER E E *43811
FOX D G 44108
FRANCOIS M 43926
FRANK R *43999
FRANK R G 43716
FRANT M S 43781
FREDERICH B 43550
FREEDMAN H *43767
FREEMAN L R *44079
FRIEDEL R A 43793
FRIEDRICH G *43591
FRIEDRICHS K H *43830
FRIES N *44016
FRISKEN W R *43886
FUERST R 43967
FUJII T *43902, *43968
FUJITANI K 43808
FUJIWARA M *43854
FUJIWARA T *44017, *44024
FUKUDA M 44040, 44041
FUKUYAMA Y *44000
FUMAROLA G 43869
FURST A 43984
FUSCO V R 43690

G

GALLOWAY T R *43887
GANGOLI N *43923
GARDNER J L 43539, 43540, 43541, 43542
GARRETT R B 43768
GAST P F 43539, 43540, 43541, 43542
GAZIYEV G A 43831
GEDDES J *43924
GELB G H *43726
GELHAAR R *43592
GERMAIN D 43977
GERSTLE R W 44072
GERSTMANN J 43730
GIAUQUE R D *43768
GIBBS A G *43888
GIDASPOW D *43956
GILBERT O L *44025
GLEBOV V P *43949
GLUCKSTEIN M E 43642
GOCKLE I J *43690
GODA L Y 43768
GOLDMAN A *43889
GOLDSTEIN S A *43769
GOLUB S *43925
GOMPF H L *43751
GONIN D 43973
GORODINSKIY S M *43831
GOTO K *43593
GOURDON F 43877
GRAEDEL T E 43827, *43832
GRAFF R A *43727
GRAUMANN D W 43733
GRAY C L 43739
GREELEY R S *43691
GREGORY D P *43594, *43728
GRIESCHE G *43595
GRILL D *44026, *44027
GRILLET Y *43926
GRISHECHKIN V S 43861
GROBMAN J *43514
GROETENBRIEL G 43998
GRONHOVD G H 43708
GROSSE BAUCKMANN E *44043
GRUDEN D 43513, *43596
GRUPPER C *44001
GUESTEN H 43938
GUILFOYLE J 43815
GUNDERSON J A 43701, 43702
GUREVICH N A 43953

H

HAAG A 43755
HAAGENSON P L 43844
HAAS M 43732
HAAS P A 43684
HAENSSGEN T *43597
HAMAL H 43863
HAMANN H 43508
HAMEL B B 43552
HAMMER M 43550
HANSEL W B 43686
HANSON K J *43912
HARDISON T L 44134
HARKER A B 43936
HARMSEN H *43515
HASEGAWA K 43786
HASHIZUME T 43776
HAWKSWORTH D L *44028, *44029
HAWS R *43516
HAYHURST A N *43927
HAYNES F N 44035
HAZARD H R *43729
HEGGESTAD H E 44013
HENEIN N A 43720
HENRY M C *43983
HERBST W 43609
HERMANS K H *44139
HERSHBERGER D L 43683
HEYWOOD J B *43517
HIGASHINO S *43692
HIGH L E 43809
HIGHTOWER J R 43684
HIGUCHI K *43598
HIGUCHI Y 43797
HILDEBRANDT E *43518
HIMI Y *43770
HINCKY M 44001
HINDMARSH A C 43883
HINKLE B K 43552
HIRONO M 43854, *43855, 43879
HIRST E *44049
HISHINUMA Y 43565
HLAVACKOVA I 43581
HO W *43984
HOAGLAND L C *43730
HOCHRAINER D *43950
HOFFMAN E J *43833
HOFFMAN K C 44062
HOFMANN W *43969
HOLDREN M W 43898
HOLMES J M 43684
HOMER J B *43928
HORNG A J *44030
HORNIG A W 43815
HOROWITZ J L *43519
HORSTOWA H *44009
HOSBEIN R L 43711, 43740
HOSHIYAMA M 43801, 43802
HOSOKAWA T 43867
HOSONO Y 43648
HOUBAUT J *43599
HOUTEN J G TEN *44044
HOVEID P *44010
HOWARD J B 43665
HUB K A *43539, *43540, *43541, *43542
HUGHES E E *43816
HULL F R *43600
HURN R W *43693
HUSAR R B 43822

HUTCHINS F P 43721, 43729
HUTCHINS P 43738
HUTCHINSON T C *43985, *44031
HYDE D L 43793
HYPR I *43553

I

IBANA H *43601
IDSO S B *43856
IGARASHI S 43878
IGARASHI T 43756
IIDA T 43709
IINOYA K *43771
IKEDA T 43603
IKENO T 43867
IKI T *43520
INABA H *43772
INGEBO R D 43514
INOUE I *44080
INOUE T *43602
IONESCU A *44045
ISAKO R *43603
ISARD W *44081, *44082
ISHIGURO K 43662
ISHIGURO T *44083
ISHII N *43604
ISHIKAWA H 44017, 44024
ISHIKAWA N *43773
ISOARD P 43977
ISOGAI T 43606
ISONO K *43857
ITABE T 43854
ITO E 43843
ITO H 43867
ITO M 43662
ITO O *43605
IVLEV L S 43861
IWAMURA E *44084
IWASAKA Y 43857
IZAWA Y 43779

J

JACKSON J *43817
JACOBS E S 43717
JACOBSON J S *44047
JAFFE L S *43543
JAGER J *43929
JAKUBOWSKI M *43731
JAMES P W *44032
JARRAULT *44085
JARRY R 43732
JASINSKI R J 43757
JELTES R *43774
JENKINS D R 43928
JEPSEN A F *43845
JERNELOV A *43544
JERVIS R E *43775
JIMINEZ R A 44056
JOATTON R *43858
JOHNSON J H 43531
JOHNSON L W 43821
JOHNSTON H S *43890
JONKE A A *43732
JUNGE C E *43859

K

KADOTANI K *43606
KAHL D 43835
KAHLERT W *43521
KAIZU Y *43776, 43866
KAKIZAKI I *43777
KALEN B *43607
KALYMON Y A 43674
KANAMARU K *43930
KANEMATSU S *43608
KANT F H *43609
KARTAGE T 43683
KASIMOVA R A 43699
KASPRZAK K S *43988
KATAGIRI A 43947
KATES R M *44050
KATO N 43603
KATO S 43526
KATSUHIKO Y *43834
KATTAWAR G W 43849
KAUFMAN D G 43983
KAWAKAMI M 43776
KAYA Y *43860
KEFER R G 43564
KELLER D J 43687, 43688, 44123
KELLER J *43778
KELLER K J *43554
KIEFER 43528
KILLACKEY J J *43733
KIM Y W *43931
KIMOTO M 43776, 43866
KIMURA H 43797
KITA T 43532
KITAMURA S *43779
KITANO H 44040, 44041
KLEINER B 43827, 43832
KLINE D I 43570
KLOK H J *44060
KLONIS H B 43844
KLOTZ F *43610
KNEIP T J *43780
KNOERNSCHILD E *43522
KOBAYAKAWA T 43532
KOBAYASHI M *43611
KOBAYASI T 43772
KOBYLINSKI T P *43612
KOCHANOV M M *43932
KOISTINEN O A *43613
KOLM H H 43665
KONDRATJEV K Y *43861
KONDRATYEV K Y *43862
KONOVALENKO Z L 43674
KOPCZYNSKI S L *43957
KORNREICH L 43780
KORPI K W 43708
KORTH M W *43818
KOSSEN N W F *43523
KOTHNY E L *43891
KOTT V N 43790
KRAUSE H 43595
KREHER G 43591
KREITH F *43752
KRIPPENE B C 43723
KRONSBEIN D G *43614
KRUEGER J A *43781
KUBOTA K 44000
KUEHNE R *43863
KULIYEV A M *43615
KULIYEV E R 43615
KUNTZ R L 43957
KUNZ W G JR 43717
KURINNYY A I 44007
KUROCHKIN A F 43560
KURYSHEVA N G *44006
KUSAKABE M 43773
KUZIN I A 43790

L

LAAG A E 43865
LACZKO M *43616
LAKIN H W *43545
LAMB N C *43617
LAMBERT M W 43652
LANDEN E W *43524
LANGE K 43596
LAPPIN F S *43618
LAPPIN R W 43618
LAPPIN T F 43618
LAUNDON J R *44033
LAURENT A 43921
LAVRENTSOV Y M 43953
LAWRENCE D K 43701, 43702
LAWTHER P J *43970
LE SUER W M *43680
LEACH J F 43858
LECKMAN J 43687, 43688, 44123
LEE N 43840
LEE Y C 43690
LEHMAN P A 43906
LEHMANN A *43835
LEIFERMAN M W *43694
LEMKE P A 44056
LENDE R V D *43986
LEVY H *43951
LI C C *43933
LIBERI V E 43717
LINDL G J *43619, *43620
LIPKIS R S 43726
LITTLE R F 43651
LIU B Y H 43822
LIU Y H *43782
LIUC B Y H *43783
LLOYD A C 43952
LODGE J P JR 43844, 43904
LOMAYA O V *43864
LOMBARDI D J 43852
LONG W 43803
LORD P W G F 43970
LOSKUTOV A I 43790
LOVELAND J W 43780
LOW M J D *43934
LOWRANCE E G *43621
LOYT A O 43932
LUDWIG F L *43892, 43894
LUEBS R E *43865
LUKER J A 43840
LUKOVA N I 43567
LUMPKIN R E 43698
LUNDBERG R D *43622
LUX F B 43747
LUX H *44018
LYS X *43935
LYSTER W R *43971

M

MADSEN N K 43883
MAEDA I *43623
MAGE D 43820
MANNY E H 43609
MARBURGER E A 44053
MARCHOW L 43988
MARGOT J *44034
MARIER J R *43995
MARK D *43784
MARK J A *43624
MARLATT W E *44086
MARPLE V A 43782
MARSHALL W F *43695
MARTELL E A 43895, *43913
MARTENS S W *43696, *43697
MARTIN M K 43517
MARTIN W B *44131
MARTSON L V 44007
MASEK V 43581
MASSIE S T 43887
MASUDA S *43625

MATREYEK W 44048
MATSUI K 43776
MATSUMOTO K 43566
MAZIN A N 43831
MCBETH R B 43844
MCCLINTOCK M *43914
MCCONNELL J C *43893
MCCRORY R J 43686
MCCUNE D C *44074
MCCURDY R F *43848
MCGUIRE L 43766
MCGUIRE T W *44124
MCKENNA J D *43626
MCKINNEY J D 43789
MCLEAN H A G 43927
MCMATH H G *43698
MCMULLEN R G *43819
MEIJER DREES F J *44132
MELNIK V F 43674
MENCHEN W R *43734
MENKOVSKIY M A 43674
MERKEL C 43597
MICHAELIS T B *43735
MICHELS A P J *43736
MIDGETT M R 43785
MILLER D R *43737
MILLER K J *43627
MILLER V H *43525
MITCHELL R S *44002, *44003
MITCHELL W J *43785
MIYAJI E 43611
MIYAMURA N 43776, 43878
MIYANO Y 43606
MIYOSHI I *43628
MIZUNO K 43593
MONKMAN J L 43537, 43793
MOON A E *43894
MOORE G E 43686
MOORE H E *43895
MOORE P L 43924
MOOZ W E 43550
MORGAN D T *43738
MORGAN HUWS D I *44035
MORISHITA T *43629
MORITA K 43603
MORITA S 43692
MORRIS A L 43844
MORRIS E B 43684
MORRIS G O *43630
MOTEGI Y *43786
MOTIN G I 43949
MOYERS J L 43780
MUNN R E 43897
MURAKAMI Y 43779
MURATA M 43776, *43866
MURCRAY D G 43889
MURCRAY F H 43889
MURRAY R G *43739
MUYDINOVA T A 43881
MYRUP L O *43896

N

NAGAI Y 43776, 43866
NAGAOKA M *43631
NAGASHIMA S 43808
NAGDA N L 44059
NAGIYEV M F *43699
NAITO K *43867
NAKAHIRA T 43777
NAKAI Y 43765
NAKAMURA Y 43847
NAKANO H 43692
NAKAYAMA Y *43989
NARAYAN R S *43824
NASH T H III *44036
NELSON G V *43632
NERI F *43633
NEWTON J L 43687, 43688, 44123
NICHOLS J P 43684
NICHOLS R A *43700
NICKLIN T *43634
NIKANDROV V Y *43903
NISHIMOTO Y 43566
NISHIMURA M 43779
NISHITSUJI A 43801, 43802
NITZ J 43592
NIZHNIK S S 43953
NOMOTO S *43868
NOUSHI H 43808
NOVAKOV T *43936
NOYON J *43635
NULL H R 43737

O

O CONNELL R L *44087
OBUCHI A *43937
OCHS H J *43636
OGAWA T *43637, 43798
OHLE H F *43638
OHTA S 43882
OHTSUKA Y *43787
OIKAWA S 43611
OKABE T 43937
OKITA T 43799, *44088
OKOLOWICZ W *43559
OKUWAKI A 43937
OLEFFE J 43998
OLIN J G *44089
OLSEN D R *43701
OLSON D R *43702
OLSON L W 43945
ONAYEV I A *43560
ONO K *43788
ORIE N G M 43986
ORTGIES R C *43561
ORTIZ L 43766
OSE H *43526
OSWALD E O *43789
OTT W *43820
OUTWATER E B *44090
OXTOBY R *43555
OZAKI M 43786

P

PADMANABHAMURTY B *43897
PAGE G C 43824
PAL G 44045
PALFITOV V F *43790
PAPETTI R 43550
PARKER M J *44058
PARSBY J 44016
PARSONS C F JR *43639
PARUNGO F P 43880
PATE J B 43844
PATTERSON C C 43832
PAULUS H J 43848
PAUSCH J *43640
PEARSON L C *44037
PEIRSON D H *43836
PEKLO P *44091
PELOSO A *43869
PENZHORN R D *43938
PERCY A W 43686
PEREZ J M 43524
PERNELA L M 43519
PERROT L 43764
PERRY J 43690
PERRY J E *43703
PETERS H *43990
PFENDER E 43955
PHILLIPS W F *43958
PICK P E *43641
PIERSON W R *43527
PILINSKAYA M A 44007
PILLAI P K C *43939
PITTS J N JR 43803, *43952
PIVER W T *43972
PLASS G N 43849
PLASSMANN *43528
PLONSKER L *43642
PLOTON L *43973, 43977
POCHASHEV Y N 43965
POET S E 43895, 43913
POETSCHKE H *43643
POGUE R 43844
POLLOCK W H 43884
POMMER G *43529
PORT C D 43983
POTT F 43976, 43994
POWERS G J 43665
POYLOV V Z 43564
PROKOFJEV M A 43861
PROULX R A 43880
PRZYBYLSKA G 43559
PUCKETT K J 44038
PUESCHEL R F 43880

Q

QUARLES J *44063, *44064, *44065, *44066, *44067, *44068, *44069, *44070, *44092, *44093, *44094, *44095, *44096, *44097, *44098, *44099, *44100, *44101, *44102, *44103, *44104

R

RADULESCU D N *43812
RADULY L *43644
RAKOVIC M 43929
RALL D P *43974
RAMASWAMI D 43732
RANZIERI A 44126
RAO K S *43740
RASMUSSEN R A 43793, 43898
RAU K 43592
RAVAN J C *44105
RAVAN J E *44106, *44133
REBOUX A *43645
RECKZEH G *43791
REHBERG R 43863
REID W M 43792
REITHER K *43646, *43647
RENTZ O *44051
REPIK A J 43712
REVIS J S *43704
RICHARDS G 43550
RICHARDSON D H S *44038
RIDDLE B C 43718
RIDDLEBAUGH S M *43530
RIFKIN E B 43642
RIPPERTON L A 43793
RISEMAN J H 43781
ROBERTS P B 43746
ROBINSON E *43898
ROBINSON G D *43915
ROBINSON J W *43792
ROCCO V A *44125
ROCHE L 43977
ROESSLER J *43813
ROFFMAN A *43870
ROMBERG G *43871
ROSE A *44107

ROSE D 43995
ROSE F 44029, *44039
ROSENBERG C W V JR *43940
ROSSBACH R J *43741
ROUZIOUX J M 43977
ROZUM K 43581
RUFF R E *44108
RUGGERI S 43684

S

SACHDEV S L *43904
SACK S 43682
SAEKI M *43648
SAITO H 43605
SAITO K *43975
SAITO T *43649
SAITO Y *43991
SAKATA M 43532
SALMON R 43684
SALOMATOV N K 43560
SALTER R G 43550
SALZANO F J 44062
SALZMAN R N 43705
SAMOSH L V *44007
SANDRIDGE R L 43778
SANTOS U D M 43851
SARTEUR R 43764
SASAKI I 43787
SASS A 43682, 43698
SATO A *43650
SATO T 43526
SAUNDERS P J W 43840, *43899
SAWICKI E *43793
SAYERS I C 43569
SCHEITLIN G E *43651, *43652
SCHERER C R *44061
SCHISCHKOW K F *43653
SCHLENKER R A 43539, 43540, 43541, 43542
SCHLEYER W T 43552
SCHLIPKOETER H W *43976
SCHMIDT F H *43905
SCHNACKE A W 43741
SCHOEPPEL R J 43739
SCHULER R E *44052
SCHURATH U 43938
SCHWARTZ S H *43705
SCHWEGLER H 43758
SCHWOCHOW F *43654
SCORER R S *43916
SEDLAK J M 43759
SEGAWA A *43837
SEIYAMA T *43655
SEKI N *43941
SEKINE K 43777
SELLERS W D *43872
SEM G J 43850
SERBANESCU G 44045
SETTELEN D 43973, *43977
SHARMA M M 43580
SHCHERBINA G I 43943
SHEDLOVSKY J P 43884
SHEESLEY D C 43844
SHEKLETON J R 43689, 43721
SHEN T T 43563
SHIDA T *43992
SHIMA H 43776, 43866
SHIMAZAKI T *43873
SHIMODA T *44109
SHINOHARA T *44040, *44041
SHIRLEY E 44126
SHRIVER E L 43939
SHUHAN G N 43568
SIGAL I Y *43953
SIGSBY J E 43793, 43809
SIKORSKI M 44009
SIMONS W *43942
SIMPSON B *43706, *43707
SINGH T 43720
SIRIGNANO W A 43714
SKARABELLA V 43581
SKOG J *44126
SLAWINSKI R C 43686
SLINN W G N 43888
SMITH C V *44110
SMITH C V JR *44111
SMITH F *43794
SMITH I C *43978
SMITH M E *44112
SMITH R A 43509
SMITH R G *43996, *44075, *44076
SMOKTIY O I 43862
SONDREAL E A 43708
SONOBE M *43874
SOOLE B W *43656
SORENSEN H *43742
SOTNIKOV Y Y 43831
SPORE R L 43824
SPRIGGS J O 43745
SQUIRES A M 43727
STAHMAN R C 43818
STAUDINGER W *43657
STAVCHANSKIY I I 43932
STEELE R D 43824
STEIGER H 43830
STENSLAND G J *43875
STEPHENS N T *43821
STEVENS J I *43556
STEWART R E *44134
STONE R E *43658
STOPA M 43559
STOROZHILOVA A I *43943
STOTZKY G 43506
SU C S 43939
SUEISHI T *44138
SUETAKA T *43659
SUGASE M 43776
SUGIMAE A *43795
SUGIURA S *43876
SULLIVAN T F P *44135
SUTCLIFFE G G 43686
SUTTON M M 43928
SUZUKI J *43796
SUZUKI K 43606
SUZUKI Y 43779, 43860
SVORE J H *44113
SWAIN M R 43683
SWEARINGEN T B *43557
SYNIUTA W D 43730
SYROTA J *43877
SZEKELY G 43616

T

TABATA I 43867
TAKAHASHI K 43867
TAKAHASHI R 43808
TAKAHASHI T 43532
TAKAI S 43672
TAKAKUWA E 43975
TAKATSUKA M *43878
TAKEMATSU T *43660
TAKEUCHI J 43843
TAMMELING G J 43986
TAMURA H 43776, 43866
TAMURA T *43661
TANAKA H 43623
TANAKA M 43882
TANASAWA Y *43662
TANNER T M *43838
TARVES R J JR *43663
TATSUKAWA R 43798
TATTERSON B F *43664
TAYLOR B W 43612
TAYLOR G W *43546
TAYLOR J K 43816
TAYLOR R W 43690
TAYTS Y M *43743
TEICHMAN T 43537
TELLUS UPPSALA 43859
TENNY H *43825
TESINK J *44046
TEVIS P G *44114
THEODORE L *43744
THODOS G 43923
THOMPSON Q E 43737
THOMPSON R J 43780
THOMPSON R S 43852
THUR G M 43715
TIEFENBACH B 43775
TILLERY M I 43766
TINGLEY D S *43531
TISONE G C *43846
TODA K *43839
TODEREANU N 43644
TOMCZAK H J *44115
TOMINGAS R 43994
TOMONARI S 43709
TONKONOGIY A V 43560
TORRENCE S L 43712
TRAIN R E *44116, *44117
TRAINOR D W 43940
TRAYSER D A 43527
TRINDADE S C *43665
TROLL V 44043
TROZZOLO A M 44048
TSUCHIYA K *43979
TSUJI T *43797
TSURUGA N *43944
TUCKER W D 43811
TUFTE P H *43708
TYBORSKI H 44009

U

UCHIDA S 43944
UCHINO O 43854, *43879
UEDA T 43776
UEJIMA S *43666
UM C H *43997
UMEZAWA T 44017, 44024
URMOSI I 43644
URONE P *43917, *43918

V

VAKAR M I 43831
VALENTINE A M 43759
VALOV M E 43588
VAN GANSE W *43998
VAN HOVE W 43998
VAN VALIN C C *43880
VAN VLECK L D 43870
VARNEY F M 43745
VASILEV O B 43861
VENEZIA R A *44127
VENTURINI P D 44124
VIETS H *43959
VINCENT V 43977
VISSER B F 43986
VOGEL G J 43732
VOLOSHCHUK V M *43881
VOZOVAYA M A *43980
VUKOVICH F M *43900

W

WAGNER J C *44011
WAGNER M 43976
WAGONER D E 43794
WAKIMOTO T *43798
WALDMANN H *43667
WALLER R E 43970
WANG T C 43726
WANNER H U 43610
WARD E J *43745
WARNER J L 43827
WARTBURG A F 43844
WASHINGTON W M *43919
WATANABE I 43798, *43799
WAY R L 44089
WAYLAND B B *43945
WEBER E *44128
WEEKS R W *43946
WEILLS J T 43539, 43540, 43541, 43542
WEITZEL H *43668
WELLS D M 43505
WERNER G *44118
WESLING G C 43741
WEST P W 43904
WESTBERG H H 43898
WEVER HESS J 43986
WEYRAUTHER 43528
WHEELER G *43800
WHITBY K T 43782, *43822
WHITBY L M 44031
WHITE D J *43746
WHITE J C *44119
WHITE L D 43793
WICKSTROM G V *44129
WILEY R F *43669
WILKNISS P E 43536
WILLEKE R *44053
WILLIAMS W J 43889
WINKLER F *43547
WINKLER H D *43670
WINNEKE G 43976
WINSCHE W E *44062
WINSLOW F H *44048
WISS J W *43747
WITCOFSKI R D *43748
WOJCIECHOWSKI P H 43722
WOOD C M *43840, 43899
WOOLLENWEBER W E *43671
WRAY G C 43632
WRIGHT E S *43749
WURM J 43728

Y

YAGUD B Y 43564
YAKHILEVICH F M 43949
YAMABE T *43672
YAMADA M 43662
YAMADA T *43709
YAMAGUCHI H *43954
YAMAGUCHI S 43602
YAMAGUCHI T *43673
YAMAKI N *43532
YAMAMOTO G *43882
YAMAMOTO I 43648
YAMAMOTO Y 44040, 44041
YAMANAKA C 43779
YAMASHITA I 43867
YANG K T 43711, 43740
YANG R T 43934
YANG S F 44030
YANO H 43611
YAVORSKIY V T *43674
YERMAKOV Y G *44019
YOCOM J E *43823
YOKOTA Y 43867
YOSHIDA K 43532
YOSHIKAWA M *43801, *43802
YOSHIZAWA S *43947
YOUNG J A 43838
YOUNG R J 43711

Z

ZAFONTE L *43803
ZANKOWSKI A *43675
ZAUGOL NIKOV S D 43932
ZEBEL G 43950
ZEBER W 43730, 43733
ZEKHOV S V 43564

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66603	66604	66605	66606	66607	66608	66609	66610	66611	66612	66613	66614	66615	66616
66617	66618	66619	66620	66621	66622	66623	66624	66625	66626	66627	66628	66629	66630
66631	66632	66633	66634	66635	66636	66637	66638	66640	66641	66642	66643	66644	66645
66646	66647	66648	66649	66650	66651	66652	66653	66654	66655	66657	66658	66659	66660
66661	66662	66663	66664	66665	66666	66667	66668	66669	66670	66671	66672	66673	66675
66676	66677	66678	66679	66680	66681	66682	66683	66684	66685	66687	66688	66689	66690
66691	66692	66693	66694	66695	66696	66697	66698	66699	66700	66701	66702	66703	66704
66705	66706	66707	66708	66709	66710	66711	66712	66713	66714	66715	66716	66717	66718
66719	66720	66721	66722	66723	66724	66725	66726	66727	66728	66729	66731	66732	66733
66735	66736	66737	66738	66739	66740	66741	66742	66743	66744	66745	66747	66748	66749
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